P A M P H L E T S

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I N D U S T R I A L   H Y G I E N E

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OCCUPATIONAL MORTALITY AS INDICATED IN LIFE-INSURANCE RECORDS FOR THE YEARS 1915-1926

By Rollo H. Britten, *Associate Statistician, Office of Industrial Hygiene and Sanitation, United States Public Health Service*

So important is a recent investigation into occupational mortality in this country [1] that a special analysis of the published report has been made from the point of view of the industrial hygienist, and the results are given in this paper. The original investigation was made jointly by the Actuarial Society of America and the Association of Life Insurance Medical Directors, and the occupational data involved 1,300,000 entrants and 22,600 deaths, during the years 1915–1926, for 12 insurance companies. For certain occupations where the only known hazard was that of accident, the data were limited to the years 1920–1926. Since policies issued only during these periods were considered, it is evident that the cumulative effect of industrial hazards is more or less lost, and that the chief value of the material for the industrial hygienist will lie in its accurate picture of the accident hazard in specific occupations and in its measure of the effect of economic and social differences upon occupational mortality.

The paucity of data in regard to occupational mortality in this country makes this report of unique interest; but it also has a valuable advantage over official mortality data by occupation, in that the information as to the number exposed to risk and the number of deaths is based on the same source, namely, the individual policy. As is well known, the fundamental weakness of official occupational mortality data lies in the fact that the information as to the population depends on the occupational census and the information as to the deaths on the death certificates (with the doctor's statement as to occupation). In life-insurance data the deaths are checked off against the original policies. We know that, at the time of issuance of the policy, the man was employed in the occupation to which his death is actually assigned. Change of occupation will still offer a difficulty, but in view of the relatively short period covered in this study, this does not appear to be a particularly disturbing factor. In connection with this point it should be noted that when an individual transferred from one occupation to another, the exposure was terminated upon reduction in the rating either from a substandard to a standard policy or from a higher to a lower extra premium for hazardous occupation. Thus, generally speaking, there will not be

[1] Joint Occupation Study: 1928. Compiled and published by the Actuarial Society of America and the Association of Life Insurance Medical Directors. New York: 1929. (Chairman of Joint Committee, Arthur Hunter, to whom grateful acknowledgment is made for review of the present paper.)

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in these data any great tendency to ascribe to a given occupation deaths actually due to the hazards of another occupation.

No policies were in operation for more than 12 years for the 1915–1926 data, or for more than 7 years for the 1920–1926 data. Of course, in many cases the workers had been employed for much longer periods in the specified occupations, but it is known that they were able to pass the usual life-insurance physical examination sometime during the period covered by the study. Therefore, one will not expect the data to be comparable with official mortality rates according to occupation, which reflect long exposure to specific industrial hazards. In connection with this point it is well to quote the following statement from the joint report:

> Previous investigations in this subject have led actuaries to expect at least two distinct types of extra mortality—one with a fairly constant extra during the working years of life, and the other with increasing additional cost to middle life or beyond. Locomotive firemen exemplify the first and saloon keepers the second type. In each of these classes the mortality ratio is affected by the duration of the experience. A less usual type is that where the extra mortality decreases with duration. In the present investigation the average duration is distinctly shorter than the average life of a policy on the books of the companies. Accordingly, for the first type of hazard, like locomotive firemen, those years are emphasized in which accidents are heaviest as a percentage of the mortality, and the ratios of actual to expected mortality are too high. For the second type, like saloon keepers, the emphasis is placed upon the period of lowest extra cost, and their ratios are understated in an experience of short duration.

The fact that all persons considered had passed life-insurance physical examinations is, of course, a point of great importance that the reader will not overlook.

The method of study limited the value of the material from the point of view of age, as data as to specific causes were secured for only two broad age groups, 15 to 39, 40 and over. For all causes, however, it has been possible to adjust the rates on the basis of a 5-year age group. The ages used in the report are those at time of issuance of the policy; but except for certain specific points this proved not to be an important factor.

All 12 of the companies cooperating in the study gave all of their substandard data (i. e., where the premium asked was higher than normal), but two gave none of their standard data, and two gave but one-fifth of it coming within the required occupational classes. The correction devised in the course of that investigation has been included in the figures used in this paper without further comment. The effect of this correction was, obviously, to reduce the mortality rates in certain occupations.

The only policies included in the study were those under which life insurance would have been issued at the standard rate of premium if it had not been for the occupation. Thus, all policies were omitted which would have been classed as substandard because of build, race,

residence, or medical impairment. Only ordinary business was included.

Both men and women were included, but in most occupational groups the men naturally predominated.

In the Joint Report the method has usually been to present the ratio of actual to expected deaths for a given number of years a policy had been in force and for a given age at issuance. The expected deaths were taken from tables of basic rates for 1915–1926 and for 1920–1926,

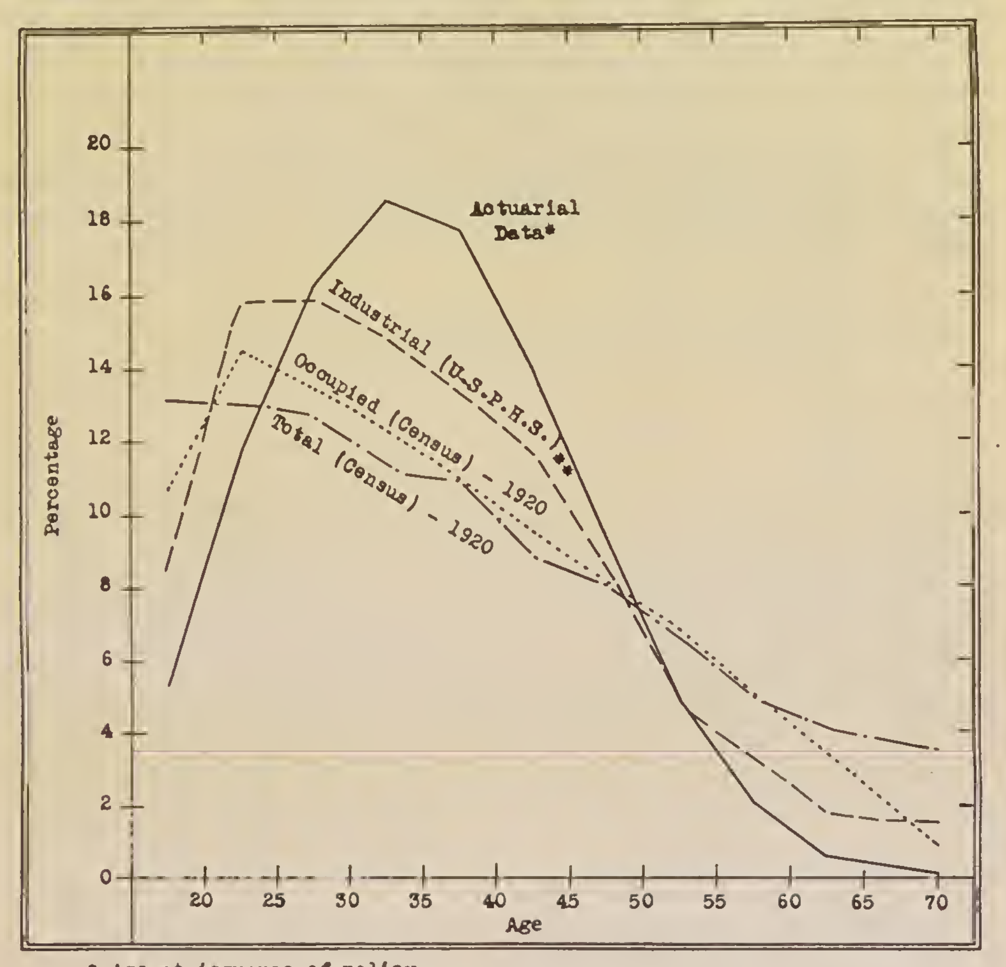


FIGURE 1.—Percentage of persons in each age group

these tables having been prepared on the basis of the investigation itself, rather than on the basis of previous standards. In this analysis, because of the familiarity of industrial hygienists with mortality rates, it has been found preferable to convert the ratios of actual to expected deaths into death rates. In doing so, it is of particular importance to note that these death rates are automatically adjusted both for age and for the length of time the policies had been in force.

The difference in the age distribution of this group of policyholders and that of the total population, however, is a point that must be kept in mind. Figure 1 presents the curves representing the percent-

age of persons in each age group, for the actuarial data, for a group of 10,000 industrial workers studied by the United States Public Health Service, for occupied males (1920 census), and for the total population of the country (15 years of age and over). It is noted that the life insurance group are concentrated in the ages from 25 to 45—ages when the risk of accidental death is especially high and the risk of death from most diseases very low.

It must be noted that the age distribution of the various occupations is by no means the same. For instance, farm laborers have 78 per cent under 30 years of age; janitors, 21 per cent. Table 1 presents the percentage in each of four broad age groups.[2] The occupations are ranked according to the percentage in the age group 15–29. Ages are those at entry, but this is of no moment from a relative point of view. The table is limited to occupations having 25,000 or more population.

TABLE 1.—*Proportion of persons in each age group by occupation* [a] *and age at entry*

Occupation	Percentage			
	15 to 29	30 to 39	40 to 49	50 and over
Farm laborers	78.5	14.1	5.8	1.5
Deliverymen for bakeries, etc., auto	71.6	22.0	5.4	1.1
Chauffeurs, truck (not delivery men)	70.9	23.4	5.1	.7
Unskilled operatives in coal mines (underground)	69.1	21.9	7.0	2.0
Auto and garage mechanics	67.1	26.9	5.3	.7
Skilled and semiskilled operatives in cotton mills	63.3	23.6	10.3	2.8
Delivery men for bakeries, etc., horse [b]	63.0	26.0	8.5	2.5
Electricians not elsewhere classified	61.5	28.4	8.8	1.3
Compositors, electrotypers, linotypers, pressmen	60.0	25.4	11.2	3.4
Semiskilled operatives in clothing manufacture (not hats)	59.4	28.6	10.1	1.9
Waiters in hotels, restaurants, and clubs (no liquor served)	58.4	31.6	8.6	1.3
Machinists not elsewhere classified	57.1	29.0	11.0	3.0
Cranemen, derrick men, and hoist men	56.7	32.9	8.9	1.4
Semiskilled fur workers	56.4	30.4	10.9	2.2
Chauffeurs, private family	55.9	34.0	8.7	1.3
Mechanics not elsewhere classified	55.8	30.7	10.5	3.0
Bakers	55.1	31.1	11.0	2.8
Draymen, teamsters, and expressmen	53.9	29.8	12.6	3.7
Rollers or roll hands in iron and steel mills	53.4	33.6	11.0	2.0
Oil and gas field foremen and miscellaneous operatives	50.6	34.7	12.1	2.6
Auto demonstrators	49.8	37.6	10.8	1.8
Semiskilled operatives in iron and steel works	47.6	32.0	15.9	4.5
Semiskilled operatives in car and railroad shops	47.2	32.6	15.9	4.4
Operatives in coal mines, underground [b]	44.8	37.2	14.8	3.1
Drug and medicine dealers, including druggists, etc	43.0	35.3	16.9	4.8
Cooks, hotel and domestic	43.0	40.2	14.0	2.8
Tailors	42.1	36.8	16.6	4.4
Firemen, fire departments	40.3	39.1	16.0	4.5
Molders, founders, and casters of iron and steel	39.8	39.2	16.9	4.0
Painters and varnishers, house	39.1	37.9	18.1	4.9
Garage proprietors, not driving [b]	38.5	44.0	14.6	3.0
Farmers	36.8	32.1	22.0	9.1
Carpenters	36.7	36.0	20.6	6.8
Policemen, including motor cycle and State enlisted	31.0	42.8	20.4	5.7
Blacksmiths not elsewhere classified	30.5	39.9	21.8	7.8
Keepers of hotels, etc., not at bar	24.7	39.7	26.1	9.5
Undertakers	24.0	35.0	26.9	14.1
Officials and mining engineers in mines, and ore dressing and concentrating mills	21.2	43.8	26.5	8.5
Janitors and sextons	21.0	34.5	27.9	16.6
Other [2] builders and building contractors in general construction	15.3	42.4	30.9	11.4
Inspecting and supervising builders and building contractors in general construction	13.3	43.1	30.7	12.9

[a] Occupations with 25,000 or more persons.
[b] And not specified.

[2] According to age at issuance—clearly an insignificant factor in the use of broad age groups.

From the point of view of safety engineers and others interested in accident prevention in industry, the most valuable feature of the report is the possibility of obtaining from it the death rate from occupational accidents in a large number of specific occupations. A point previously mentioned must be stressed here: The data have the unique value of having both the population and death records obtained from a single source, so that the occupation ascribed to the man at the time of his death is very likely to have been the occupation at the time when the policy was taken out and, furthermore, the classification will be identical in both cases. The following table, therefore, which gives the death rates per 1,000 for occupational accidents in specific occupations, is a very concrete and relatively accurate picture of occupational accidents in this country since 1915. The rates are given without adjustment as the data were not in such a form that an adjustment by age could be made. The figure for all accidents is included at the right.

TABLE 2.—*Death rates for occupational accidents, by specific occupation*

Occupation	Death rate per 1,000	
	Occupational accidents	All accidents
Linemen and cable splicers in electric light and power plants	5.19	5.89
Oil and gas field rig builders and handlers of explosives	5.00	6.07
Skilled coal miners (underground)	4.85	5.75
Iron mine operatives (underground)	3.35	4.39
Other structural iron workers not elsewhere classified	2.89	4.16
Not specified operatives in coal mines (underground)	2.76	3.45
Freight (and not specified) train brakemen	2.72	3.74
Safety engineers and Government mine inspectors	2.63	2.79
Bratticemen, etc., in coal mines (underground)	2.47	2.93
Unskilled operatives in coal mines (underground)	2.18	2.66
Foremen in mines, etc. (underground)	1.87	2.31
Mine machinists and mechanics (underground)	1.68	1.94
Freight (and not specified) train conductors	1.66	2.27
Switchmen and flagmen	1.61	2.21
Telegraph and telephone foremen and linemen (not climbing poles or not specified)	1.58	2.12
Longshoremen, stevedores, and freight handlers	1.51	2.12
Constables, marshals, and sheriffs who arrest	1.47	2.58
Officers on ocean, Great Lakes, river and harbor craft	1.43	1.87
Forestry (not owners, engineers, or firemen)	1.41	2.06
Locomotive engineers	1.36	1.82
Copper mine operatives (underground)	1.35	2.84
Coal mine operatives (not underground)	1.30	1.80
Working window cleaners	1.29	2.00
Fishermen	1.26	2.66
Pole climbers in telephone and telegraph construction and operation	1.24	2.15
Mine stationary engineers and hoist men, etc. (not underground)	1.16	1.59
Mechanics in steel mills	1.11	1.97
Locomotive firemen	1.07	1.80
Surface operatives in mines other than coal	1.03	1.71
Quarry operatives (not handling explosives)	1.03	1.62
Car repairers in roundhouse, track, and yard	.93	1.21
Electricians in electric light and power plants	.92	1.48
Officials and mining engineers in mines, and ore dressing and concentrating mills	.90	1.97
Policemen (including motor cycle and State enlisted)	.88	1.39
Certain other operatives in electric light and power plants	.84	1.54
Mine stationary engineers and hoist men, etc. (underground)	.79	1.25
Laborers in iron and steel works	.76	1.79
Yard foremen and inspectors	.76	1.17
Furnacemen, puddlers, etc., in iron and steel works	.74	1.23
Firemen (fire departments)	.74	1.40
Oil and gas field foremen and miscellaneous operatives	.72	1.48
Mine machinists and mechanics (not underground)	.68	1.25
Electricians not elsewhere classified	.67	1.16
Semiskilled operatives in certain chemical trades (acid, fertilizer, glue, white lead, etc.)	65	1.30
Army officers	.65	1.05
Section and track laborers	.58	1.22
Workers in petroleum refineries	.54	1.44

TABLE 2.—*Death rates for occupational accidents, by specific occupation*—Con.

Occupation	Death rate per 1,000	
	Occupational accidents	All accidents
Carriage riders, doggers, block setters, and other skilled operatives in saw and planing mills	0.50	1.30
Cranemen, derrick men, and hoist men	.49	.99
Miscellaneous laborers	.48	1.70
Conductors and guards on street and interurban railroads	.46	.90
Auto delivery men for bakeries, etc	.38	1.18
Truck chauffeurs (not delivery men)	.33	.79
Rollers and roll hands in iron and steel mills	.31	.87
Carpenters	.30	.84
Draymen, teamsters, and expressmen	.29	.85
Other and not specified builders and building contractors in general construction	.27	.85
Brick and stone masons	.26	.91
Semiskilled operatives in iron and steel works	.26	.76
Farmers	.23	.81
Auto and garage mechanics	.23	.93
Garage proprietors not driving or not specified	.21	.75
Farm laborers	.19	.96
Mechanics not elsewhere classified	.19	.72
Semiskilled operatives in car and railroad shops	.19	.74
Molders, founders, and casters of iron and steel	.17	.73
Auto demonstrators	.17	.71
Machinists not elsewhere classified	.14	.72
Painters and varnishers (house)	.13	.64

It is quite evident that there are a large group of occupations in this country at the present time subject to a severe accident hazard. The relative risk in the different industrial groups is brought out clearly in the table. The hazard is most marked among linemen and cable splicers in electric light and power plants, oil and gas field rig builders and handlers of explosives, skilled coal miners (underground), and iron-mine operatives (underground). But in running down the list one finds a large number of occupations where the occupational accidents must form an important part of the total mortality in the group.[3]

Although it has been emphasized that data of this character are quite incapable of representing the mortality "with increasing additional cost to middle life or beyond," as it is put in the Joint Report, it was of great interest to determine whether differences in the mortality by occupation would be found to be expressive of economic or social levels. It was first necessary to eliminate accidental deaths, occupational or otherwise, from the comparison. This was a phase of the investigation which did not concern the Joint Committee, since they were interested in establishing ratios for the total mortality, on the basis of which the various occupations could be rated, but from the point of view of the industrial hygienist it is necessary to separate accidents from the other causes of death. The tables in the Joint Report were in such form that this could easily be done, and in Table 3 are given the death rates per 1,000 for each occupation with 25,000 or more persons, exclusive of accidents, occupational and nonoccu-

[3] Insufficient data are available as yet with respect to aviators. In the light of the accident mortality rates given in this table, however, it is of interest to quote the statement of Dr. L. I. Dublin that "the fatal accident rate for full-time pilots is now estimated at anywhere from 25 to 50 deaths per 1,000 annually. * * * It has become clear that the hazard to passengers taking an occasional flight is negligible." ("The Job and the Life Span," Harpers' Monthly Magazine, January, 1930.)

pational. As before indicated, these rates are adjusted for age and for the number of years the policy had been in force, but it must be kept in mind that the age distribution to which the adjustment has been made is that of the life-insurance data as a whole, not of the general population of the United States. We would not expect, therefore, to find mortality rates nearly so high as those of the country generally, even aside from the question of selection due to the physical examination.

Interpretation of the relative rates in this table is quite difficult. High rates are found for unskilled and not specified operatives in coal mines (underground), keepers of hotels, semiskilled operatives in iron and steel works; and on the other hand, low rates were found for builders and contractors, electricians, and farmers. But a close inspection of the table indicates many inconsistencies, such as a high mortality level for undertakers and policemen, and a low mortality level for delivery men (auto), semiskilled fur workers, etc. The data do not appear to be capable of further analysis in regard to mortality. The failure to obtain any clear-cut distinctions in different economic or social levels may be due to an extent to the factor of selection present in all life-insurance data.

TABLE 3.—*Death rates, all causes except accidents, adjusted for age and number of years policy had been in force*

Occupation	Death rate per 1,000	Average age at entry
Not specified operatives in coal mines (underground)	5.46	36
Molders, founders, and casters of iron and steel	4.59	35
Cranemen, derrick men, and hoist men	4.48	31
Undertakers	4.40	42
Policemen, including motor cycle and State enlisted	4.39	38
Keepers of hotels, etc., not at bar	4.08	41
Officials and mining engineers in mines, and ore dressing and concentrating mills	3.91	40
Semiskilled operatives in iron and steel works	3.79	37
Unskilled operatives in coal mines (underground)	3.76	30
Painters and varnishers, house	3.65	38
Draymen, teamsters, and expressmen	3.64	34
Mechanics not elsewhere classified	3.61	34
Waiters in hotels, restaurants, and clubs (no liquor served)	3.49	30
Cooks, hotel and domestic	3.39	32
Janitors and sextons	3.34	44
Semiskilled operatives in car and railroad shops	3.33	36
Deliverymen for bakeries, etc., horse [1]	3.29	32
Skilled and semiskilled operatives in cotton mills	3.28	34
Drug and medicine dealers, including druggists, etc	3.25	37
Firemen, fire departments	3.25	36
Semiskilled operatives in clothing manufacture (not hats)	3.25	33
Auto demonstrators	3.19	32
Machinists not elsewhere classified	3.11	34
Bakers	3.08	31
Garage proprietors, not driving [1]	3.02	35
Other and not specified builders and building contractors in general construction	3.01	42
Chauffeurs, private family	2.99	30
Compositors, electrotypers, linotypers, pressmen	2.98	33
Farm laborers	2.96	28
Oil and gas field foremen and miscellaneous operatives	2.93	32
Carpenters	2.93	38
Rollers and roll hands in iron and steel mills	2.87	31
Semiskilled fur workers	2.81	34
Chauffeurs, truck (not delivery men)	2.81	30
Farmers	2.57	40
Electricians not elsewhere classified	2.42	31
Delivery men for bakeries, etc., auto	2.39	29
Auto and garage mechanics	2.27	28
Inspecting and supervising builders and building contractors in general construction	2.21	42

[1] And not specified.

In this connection, however, the following quotation in regard to laborers may be taken from the Joint Report (p. 52):

The unfavorable mortality among laborers constitutes a distinct feature of this report. In all cases accidents were significantly high as a cause of death. * * * Tuberculosis was most severe among those working indoors, in steel mills and foundries, and about normal among the laborers on railroad sections and on city streets. Pneumonia was above the average in every group, while the only other cause significantly serious was heart disease among the section hands.

That a certain difference associated with social or economic levels does exist was shown by a special analysis. In so far as possible specific occupations were combined into four groups and the adjusted death rates obtained for each group. These are given in Table 4.

TABLE 4.—*Death rates from all causes, exclusive of accidents,*[1] *adjusted for age and number of years policy had been in force; by social classes*

Occupational class	Death rate per 1,000
Professional and semiprofessional	3.27
Skilled	3.67
Semiskilled	4.53
Unskilled [2]	4.77

[1] Accidents were deducted, but this had to be done on actual, not adjusted, basis.
[2] Farm laborers excluded.

The semiskilled and unskilled have definitely higher mortality rates than the professional (and semiprofessional) and the skilled.

The form in which the data were collected, although suitable for the purpose of the investigation itself, made any very detailed comparison as to causes of death impossible. Data were obtained for two broad age groups (15 to 39 and 40 and over). In preference to presenting a table of the rates by cause in the various occupations in these two age groups, there is given at this point a quotation from the Joint Report itself bearing on the causes of mortality in the various occupations:

Tuberculosis of the lungs stands high in 25 classes, and these are chiefly among the groups of unskilled labor and the lower social strata. This tendency has been emphasized by other investigators, particularly in connection with the report for England and Wales (1921–1923). Tuberculosis is three times as heavy at each age group among unskilled laborers as it is among the upper and middle classes of society. This consideration may explain the presence of high tuberculosis rates among farm laborers, general laborers, hucksters, and freight elevator tenders. Dust is an important factor in connection with tuberculosis. Examples of dust hazard are found among miners of copper, gold, or silver, stonecutters, workers in sawmills, chippers of metal and other skilled metal workers, molders in brass and bronze, carders and combers of cotton, and upholsterers. It has been suggested that alcoholism may have an influence on the tuberculosis rate, and this report shows a high mortality from tuberculosis among hotel keepers, waiters, and cooks in hotels, restaurants, and clubs, indicating that the suggestion has some foundation. The mortality from this cause was low among farmers and druggists.

Pneumonia appears of importance in 17 classes, the principal factor in which is exposure to abnormal temperatures. Thus, there are included seven underground mining classes, as well as rollers, roll hands, and laborers in steel mills. Inclement weather conditions may lead to high death rates from this cause among chauffeurs, and alcoholism among actors and saloon keepers. Social class seems to have little importance in regard to pneumonia.

Bright's disease or chronic nephritis was significant in 10 classes, and cerebral hemorrhage or apoplexy in 5 classes. It may be mentioned that four of the latter are in the same occupations as the former, namely, the group of underground coal miners, buyers and shippers of livestock, guards, watchmen, doorkeepers, and hotel keepers. Bright's disease was also important among section foremen, locomotive engineers, motormen, proprietors driving their own express wagons, and policemen. Heart disease—which some investigators have found to be correlated with both Bright's disease and cerebral hemorrhage—appears as a significant cause in eight occupations of this investigation, and five of these have already been mentioned in reference to these two other causes of death. The remaining three employments were tailors, undertakers, and janitors.

Cancer as a cause of death has given rise to much speculation in recent years. Efforts have been made to show that it is most prevalent among those exposed to (*a*) coal-tar preparations, expecially soft coal, (*b*) products of decomposition of living matter, (*c*) chemical fumes, (*d*) metallic dusts and fumes, (*e*) certain food and drink conditions, (*f*) alcoholism. The 10 employments showing a high death rate from cancer in the present research are railroad section foremen, janitors, junk and rag dealers, blacksmiths, workers in nonalcoholic beverages, hotel keepers, freight elevator tenders, tailors and semiskilled clothing workers and guards, watchmen and doorkeepers. Those last mentioned have had in many cases some other principal occupation before becoming guards, watchmen, and doorkeepers as a method of partial retirement from active service.

Appendicitis was prominent in the following classes: Farmers, mine officials, mine foremen underground, druggists, and policemen. In the case of farmers and those attached to mines, the difficulty of obtaining adequate medical and surgical attention for this acute disease has been suggested as a reason for the high death rate from appendicitis.

Cirrhosis of the liver was significantly high among bartenders and saloon keepers, and also among the large group of underground coal miners. It showed a low rate among farmers. This cause is well known to be closely related to alcoholism.

The purpose of the joint investigation of the Actuarial Society and the Association of Life Insurance Medical Directors was to furnish information on the basis of which the ratings of insurance companies for specific occupations could be revised. It is not possible in this review to summarize these recommended ratings. Reference is made therefore to the supplementary report of the Joint Committee based on this and other investigations.[4] The report gives suggested ratings for total insurance and also for accidental death benefits for a large number of specific occupations.

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[4] Occupational Mortality Ratings. Compiled and published by the Actuarial Society of America and the Association of Life Insurance Medical Directors. New York, December, 1929.

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PROPOSED SAFEGUARDS FOR THE PROTECTION OF WORKERS IN SHOP TRADES

GRACE M. BURNHAM
Executive Secretary, Workers' Health Bureau

read before the

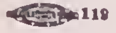


FIRST NATIONAL LABOR HEALTH CONFERENCE

Cleveland, Ohio, June 18-19, 1927

under the auspices of the

Workers' Health Bureau of America
799 BROADWAY, NEW YORK



PROPOSED SAFEGUARDS FOR THE PROTECTION OF WORKERS IN SHOP TRADES

Grace M. Burnham
Executive Secretary, Workers' Health Bureau

The outstanding characteristic of American industry today is its concentration in the hands of a small group of financial magnates who, through interlocking directorates, control the operations of gigantic productive units, dictating on the one hand the cost to the public of the materials produced and on the other holding the power of life and death over the 25,000,000 workers employed in the factories, mills, and workshops of this country.

The automobile industry presents an excellent illustration of this concentration. With a total of only 351 plants, the industry employs more than a quarter of a million workers and ranks first of all manufacturing industries in the country in the annual wholesale value of its products.

The Ford interests now control all their own sources of raw material. The Company owns four coal properties with a daily output of 14,500 tons of coal . . . valuable iron mines . . . approximately half a million acres of timber land. It operates its own transportation facilities, railroads and steamship lines, electric power plants, blasting furnaces, coke ovens, saw mills, cement plants, glass and paper mills, to say nothing of controlling the news through the ownership and publication of the Dearborn Independent.

Henry Ford and the General Motors Company are listed among the twelve giant corporations with profits totalling $1,000,000,000 each in 1926. The General Motors Company is partly owned by the Du Pont Company which not only controls the explosive and chemical industries, but reaches out through its paint and varnish manufacturing plants into an alliance with the Standard Oil Company and through its General Motors interests into the automobile industry. The Du Pont Company has been instrumental in pushing the widespread use of the spray painting machine, operated under air pressure, which is replacing hand-brush painting and is responsible for increasing every health hazard in the industry.

Policies of Employers in Direct Opposition to Interests of Workers

This concentration of capital and power in the hands of the employers breeds certain policies which are in direct opposition to the efforts of labor to protect life and health.

The employers are continuously strengthening and extending their own organization, forming manufacturers' associations, chambers of commerce, trade and banking groups. The full force of this machinery is turned against the workers when they attempt to organize into trade unions. It is used to break strikes and has succeeded in keeping the majority of American workers unorganized. "Shop committees, unions, or labor leaders are unnecessary because there is nothing to argue about," says Henry Ford.

On the political field, the employers maintain powerful lobbies to fight every attempt at protective labor legislation, with the result that, except for Compensation Laws which are far from adequate and totally lacking in five States, American workers are for the most part unprotected by legal safeguards.

The use of high-power machinery is reducing workers to mere automatons and speeding them up to the point where human endurance can go no further.

Discoveries of modern chemistry have flooded the market with an endless variety of products, with the result that chemicals, often extremely poisonous, are experimented with, regardless of their effect on the workers who are forced to handle them.

No Control of Industrial Poisons

Tetra-Ethyl Lead

When the introduction of a new poison like *tetra ethyl lead* (looney gas) results in a catastrophe, killing five men and poisoning some forty others in one plant alone, that of the Standard Oil Company in Bayway, N. J., we find that we have no national machinery for prohibiting the use of industrial materials, no matter how deadly. Forced to turn to the States for protection we are faced with the spectacle that a year after protective regulations have been recommended by the United States' Public Health Service, only one of 26 States from which information coud be obtained had taken any legislative action to safeguard workers engaged in handling tetra-ethyl lead or ethyl gasoline.

Benzol, one of the poisons which came into wide use in industry following the World War, is a by-product of coal tar. It is a powerful solvent for rubber, gum, fats, and resins. It is so deadly that one part of benzol to 10,000 parts of air may cause poisoning. Benzol destroys both the red and the white blood cells without which life cannot go on.

After a number of young girls in Maryland died as a result of benzol poisoning, the National Safety Council, an organization composed largely of employers and their physicians and engineers, undertook a three-year investigation of this material. The final report of the Safety Council Committee was made in September, 1925. The report states: "...we collected a list of 15 fatal and 83 non-fatal cases of benzol poisoning, occurring during the years immediately preceding" our investigation. "Out of 23 establishments in which ten or more persons were exposed to benzol, eleven, or nearly half, reported cases of poisoning, while of six plants in which 50 or more employees were exposed, all but one had had poisoning cases."

The report continues: "During the last year of our work we made no attempt to extend this survey of the extent of the benzol hazard, but at least seven fatalities from this cause were brought to our attention during the first nine months of 1925, and during the five years ending June, 1925, there were in the State of Ohio alone 29 cases of benzol poisoning, so clear and obvious as to receive the benefits of industrial compensation.

"It is, therefore, clear that the hazard of benzol poisoning in American industry is a serious one and constitutes one of the major problems of industrial hygiene."

In ending its report, the National Safety Council Committee says: "We are forced to conclude that the control of the benzol hazard (except where the substance is used in completely closed systems) is exceedingly difficult." Substitutes are recommended wherever possible.

Benzol poisoning means death . . . the fumes cannot be controlled . . . effective substitutes are already on the market . . . yet benzol remains an uncontrolled hazard in 57 trades. Four artificial leather workers in New Jersey paid the death penalty for its continuance last January. Although the National Safety Council report was made over a year ago, not one State has considered the question of sufficient importance to recommend legislation prohibiting the use of benzol.

Lead

Sir Thomas Oliver, international authority on industrial hygiene, states that more deaths have been caused by lead than by any other metal. Lead is a hazard in no less than 150 trades, among them printing, painting, potteries, storage batteries.

Dr. Alice Hamilton describes the case of a painter 42 years old, whom she saw sitting huddled up in a chair, looking like a broken man of 80, ready to fall into his grave. He couldn't feed himself, he couldn't dress himself, he had to be tended like a baby. He had been a painter for twenty years, doing interior work. He had sandpapered lead paint and breathed the dust.

"Lead not only causes painters' colic and apoplexy, but results in wrist drop, hardening of the arteries and seriously affects the heart and kidneys. It works slowly, insidiously, so that a man hardly knows what is happening to him, till a breakdown occurs," says Dr. Hamilton.

In 1912, the United States Department of Labor issued a bulletin on lead poisoning in American potteries. In 1921, they issued another bulletin. The first report stated that from 7 to 27 per cent of workers in American potteries had lead poisoning, compared with one per cent among English workers. The 1921 report stated that from 13 to 34 per cent of American potters had lead poisoning. As far back as 1901, England passed strict regulations for the protection of workers in potteries even to the point of limiting the amount of lead to be used in the glaze.

Try to introduce a bill in any State in the Union for the limitation of lead in pottery glazes, and you will find an employer's lobby threatening the legislators to take millions of dollars of invested capital out of the State and move to a neighboring State where the rights of industry are unmolested.

Zinc and Mercury

More easily controlled through systems of adequate exhaust ventilation are such poisons as *zinc* and *mercury*. Foundries which fail to provide this protection for their workers are responsible for the disease known as brass chills, which is a malaria-like chill and fever appearing a few hours after the fumes are inhaled and causing coughing, headache, loss of appetite, nausea and vomiting. Later cramps, sharp pains, shivering, ending in exhaustion, occur. The attacks may last from a few hours to twenty hours.

All of the men examined by the United States Public Health Service in one New York foundry, in 1925, gave histories of brass chills, in another foundry 39 per cent had been affected, in still another 33 per cent, and in the remaining foundry 64 per cent. One quarter of the workers averaged attacks once a week.

No wonder that Dr. Hayhurst in his examination of brass workers in Chicago found only 15 per cent over 40 years old. 52 attacks of brass chills a year can hardly lead to long years of work or life.

In Danbury, Conn., a silk mill found that its dyes "went bad" during the summer months when the windows were open. After repeated experiments, the puzzle was solved. The air which blew in from the hat factories across the way was so laden with mercury fumes used to treat the fur in making hats, that the mercury changed the dye in the silk mill. A chemical was finally used which neutralized the mercury and so the silk could again be dyed its proper color.

Workers, however, cannot be "neutralized" by treating them with powerful chemicals. 43 out of every 100 Danbury hatters are suffering from mercury poisoning. Starting with nervousness and a slight tremor the shakes gradually increase, affecting the speech, the ability to use one's hands and even the power to walk. The mind also becomes depressed until the worker is a helpless invalid, unable to work, feed, or even dress himself.

In England and Germany, cases of "hatters' shakes" have been practically eliminated. Enclosed systems of cutting and blowing the fur, hoods over the kettles where hats are "sized" and dyed, systems of exhaust ventilation where fresh air is blown in and steam-laden air drawn out of the rooms, are some of the methods by which workers are protected.

Industrial Tuberculosis

Industrial tuberculosis may be caused by breathing particles of sharp, fine dust which damage the lungs and predispose to tuberculosis or as in the case of the textile industry can be directly traced to dampness, heat, dust, long and exhausting hours of work and low wages.

Six out of every 100 New Jersey textile workers examined by the Workers' Health Bureau last year had tuberculosis—a rate twelve times higher than for industrial insurance company policy holders and six times higher than for New York garment workers.

Unless properly protected by adequate systems of exhaust ventilation, potters, emery grinders, tool grinders, polishers and buffers,

breathe the sharp particles of silica dust from the materials or grinding wheels which they use and pay the price in tuberculosis and premature death.

In one emery wheel factory in Niagara Falls, N. Y., 12,000 pounds of carborundum dust is collected in the blower system each day. That dust would otherwise go into the lungs of the workers employed in the factory.

Dr. Britton of the International Harvester Company states that *silicosis* (from breathing granite, quartz, or flint dust) may be found in almost every modern industry. He describes a man who was totally and permanently disabled after one year's service as a sand blaster.

Dr. Colcord gives the average life of axe grinders as from 5 to 7 years.

Tuberculosis in shop trades is unnecessary and need not exist. Prevention is possible through proper ventilation, removal of steam and heat, and exhausts to draw off the dust at the point where it is generated.

Power-Driven Tools

Another factor which is responsible for increasing the amount of tuberculosis in many trades is the introduction of the pneumatic tool which operates under air pressure, increasing to an alarming extent the danger of silicosis and tuberculosis to stone cutters and carvers. So far, all efforts to equip this tool with an adequate exhaust system to carry off the dust have been unsuccessful. Its prohibition is the only possible method of guarding workers against the increased risk of tuberculosis.

In an article in the Wall Street Journal, November 22, 1926, "Ingenious Tools" are described which now aid the Motor Industry to pile up one billion dollars worth of profits per year, per company.

"The production of a car every five minutes used to be considered a peak of achievement . . . now the Hudson speed under normal conditions is a car every 30 seconds . . . and it has been as low as every 23 seconds."

This is the way it is done . . . moving belts . . . one man tending two instead of one assembly line (a saving of $8,700 a week for the Hudson Motor Car Company on a production of 900 cars) . . . the driving of 1000 bolts by power-driven tools where hand methods drove 100 bolts . . . eight men doing the work of twelve through the use of

the air motor . . . fender assembly conveyors using six men and 14 women instead of 36 men as formerly, cutting the cost 50 per cent.

Spray-Painting

This same article goes on to praise the introduction of the spray gun for the painting of automobiles. Where twenty men formerly painted 275 chassis a day, 18 men now spray 1200. The spraying is done without the use of masks . . . "by reason of the adoption of an improved exhaust which eliminates all floating particles from the air."

We know of no such device. In Detroit, a few weeks ago, 21 workers were burned to death in an explosion originating in the paint spraying department of the Briggs Automobile Manufacturing Plant. The paint was composed of benzol, wood alcohol, nitro cellulose (the base for gun powder), and other inflammable materials. Fortunately, the Company was insured for twenty million dollars which totally covered their loss and a sprinkler system saved the jiggs and dyes. The maximum compensation which the widows and orphans of the dead men can collect under the Michigan Law is $4,200 for each death. Those victims who survived, burned and mutilated for life, can collect a maximum of $18 a week.

The explosion in the Briggs Plant is conclusive proof that systems of ventilation *are not removing poisonous fumes in factories where spraying is being done.* Further evidence is furnished in a study of 473 compensation cases of workers in Ohio during the years 1922-25. All of these workers were exposed to paint hazards. They were employed in house painting, enameling and the spraying of stoves, pottery, glass, brass, railroad cars, automobiles, and other related processes.

85 per cent of the occupational disease cases among workers using the spray were *lead poisoning cases.* 100 per cent of the cases among automobile sprayers were lead poisoning while hand brush painters had 52 per cent of lead and 48 per cent skin diseases.

Workers spraying automobiles and railroad cars were *all poisoned in less than one year* from the time they were employed.

A concerted effort is being made throughout the country to replace hand brush with spray painting. Organized labor must definitely oppose this campaign. We must demand:

Prohibition of all open spraying.

Prohibition of benzol, wood alcohol, and lead in all paint materials.

Garage Hazards

In contrast to the highly technical organization of automobile manufacturing plants are the widely scattered mushroom garages and auto repair shops which spring into being in every town and hamlet as the number of automobiles increases.

Auto mechanics and garage workers face the danger of lead poisoning, dusts from cleaning out motors, fumes from benzol and other deadly materials used in gasoline, and involuntary suicide from carbon monoxide. 113 garage workers were asphyxiated in New York garages in two years.

Night work, a seven-day week, totalling 84 hours of work, are not uncommon among the men who are earning a maximum of 28 dollars a week washing the muck off somebody's limousine.

Garages are for the most part unregulated. No State has an adequate law requiring proper ventilation, removal of dusts and fumes, or providing sanitary facilities or first aid. Because of the danger from asphyxiation, every garage should be equipped with oxygen tanks for emergency treatment of "gassed workers."

In New York City is took us six months to get a ruling as to whether garages were factories, mercantile establishments, or laundries. Workers in factories and mercantile establishments in New York State are entitled to one day's rest in seven. Only two other States, Massachusetts and Wisconsin, have such a law. After much legal juggling it was ruled that garage workers, employed in establishments where repair work was being done or where material was sold, were entitled to one day's rest in seven.

Hours of Work and Health

"One of the most important predisposing causes of disease is overwork or fatigue," says Dr. George Kober, one of the leading industrial hygienists in this country, "because the accumulation of waste products in the blood, together with the expended nervous energy, combine to render the system more susceptible to disease. Excessive work is inimical to health and long hours and hard work is calculated to diminish the general power of resistance and thus bring about physical deterioration. *Hence the necessity of laws regulating the hours of labor and the enforcement of a day of rest,* as contemplated by the Sunday laws."

"A typical succession of events is first fatigue, then colds, then tuberculosis, then death," says Prof. Irving Fisher.

The combined effect of long hours and heat on workers exposed to poisons is shown in the experience of one of the shell loading plants using TNT, where cases of poisoning increased from 23 during the month of June under an 8-hour day to 69 in August, under a 12-hour day.

77 New Jersey dye workers, examined by the Workers' Health Bureau last year, showed them suffering from a sickness rate (tuberculosis, heart disease, anemia), far higher than found by various investigators in other hazardous industries. Not one dye worker examined was in good health. "The atmosphere described in these plants," says Dr. Alice Hamilton in concluding the report, "resembles that of the tropics. No sane man would go to the tropics and try to keep up his normal rate of exertion, he would know that breakdown would be sure to follow. Yet here tropical conditions are reproduced and men are expected to work for 10, 11, and even 12, or more hours a day."

Bakers work in hot shops, filled with smoke, steam, dust, and coal gas fumes. Night work and long hours are common. Cellar shops still exist, damp, dark, and unhealthful. The result is a high percentage of respiratory diseases, high blood pressure, heart disease, and anemia. "In the clinic," says Dr. Louis Harris, of the New York City Health Department, in his report on medical examination of bakers, "one can readily pick out a large percentage of bakers by a peculiar and characteristic pallor, to a large degree due to the peculiar working environment and the irregular hours of sleep."

A guaranteed one day's rest in seven, the forty-hour five-day week, the further reduction of hours of work in dangerous occupations, the prohibition of night work in bakeries—these are all necessary planks in a Trade Union Health Program.

Accidents

The manufacturing industries were responsible for 41 per cent of the accidents reported to the New York State Industrial Commission for the year 1926. While accidents in manufacturing decreased in this State 7 per cent for the past two years, they still total over 41,000 and these represent only accidents which disabled workers seven days or more.

The State of Illinois reports 23,600 accidents in manufacturing

industries for the year ending June 30, 1925 . . . representing 43 per cent of the total number of accidents in all branches of industry.

"Because there was no noticeable increase in the Industrial Accidents rate during 1924, when comparison is made with 1923," says the Governor in his report, "by no means gives warrant for assuming that the accidents rate in Illinois is satisfactory . . . the increase in the number of accidents in the year 1923 was 31 per cent over the number for 1922. In spite of the fact that there was a material decrease in the number of employees exposed to the hazard of death, because fewer of them had jobs in 1924, practically the same number were killed as during the previous year. More than 80 per cent of the killed workers were survived by persons wholly dependent on them."

In an article, entitled "Safety in Bakeries," in the February, 1927, issue of the Bulletin of the Pennsylvania Department of Labor and Industries, "five fatal accidents were reported in the past two years due to workers being drawn into the mixing machines, which were being cleaned while in motion." The dough is so heavy and clings so tightly to the paddles that power is necessary to turn them as cleaning progresses. The result is that the workers are caught in the paddles and if no person is nearby to cut off the power, they are drawn into the machine and horribly mangled. In one case an employe was drawn into the machine, wound around the paddles, and smothered to death by the dough.

The matter was taken up by the Department of Labor with the manufacturers of dough-mixing machines to find out whether some attachment could not be made for these mixing machines which would prevent this type of accident. As a result, a safety device was evolved which seems to be satisfactory in every way. Every mixing machine in every bakery in Pennsylvania has been ordered to be equipped with this device.

The proper guarding of machinery would have prevented nine out of ten permanent injuries occurring to girls in the State of Pennsylvania and one-half those occurring to boys. Of the 168 accidents in the metal industry, resulting in permanent disability to young workers, 73 per cent were due to machinery.

These illustrations of the tremendous number of accidents point to one conclusion—*the necessity for guarding machinery before, not after workers have been injured.*

The United States Department of Labor Statistics has put forward the suggestion that no machinery should be transported in interstate

commerce unless equipped with proper guards and safety devices to prevent accidents, thus going on record as favoring national control for this danger to workers. Machinery so equipped should bear an official label. This is one step towards preventing some of the accidents which now result in death and disability to hundreds of thousands of our workers.

Protection for Young Persons and Women

Women and children should be especially protected. No child under 16 should be employed under any circumstances in any trade. Night work should be prohibited for all women and boys under 21. The employment of all children under 18 should be prohibited in dangerous trades and processes. Such a regulation should also apply to women, the child bearers of the future.

"Women are more susceptible to poisons than men. It is plain to all that if a poison is circulating in the blood of the mother, it is practically certain to affect the child she is carrying," says Dr. Alice Hamilton in "Women and Industrial Poisons." "Lead poisoning is known to do this. If a lead worker becomes pregnant, she is more likely to abort or bear a still-born child, and if her child is born alive, it is more likely to die within the first year of life. Carbon monoxide and benzol may cause abortion and the latter renders a healthy pregnancy almost impossible."

A Trade Union Health Program for Shop Trades

Fifty-six shop trades are represented in the American Federation of Labor. A Health Program for these trades covers the whole field of Industrial Hygiene. This program must include: The prohibition of poisons whose use cannot be made safe; prohibition of interstate shipment of unguarded machinery; the control of dangerous methods of work, such as the spray gun in the painting industry; adequate exhaust systems to carry off all poisons, fumes, and dusts; efficient systems of ventilation to rid workshops of heat and steam and assure a plentiful supply of fresh air; proper lighting; provisions of seats; installation of adequate and sufficient sanitary facilities; hot water, soap and towels, drinking water with individual cups, lunch rooms away from dust and fumes, dressing rooms, individual lockers, and modern, sanitary toilets; first-aid supplies with a trained person to administer them.

Measures, such as the prohibition of poisons, too powerful to be controlled, the prohibition of interstate shipment of unguarded ma-

chinery and improperly labeled poisons, require the passage of national laws. Constitutional precedents have already been established for this procedure in the case of the prohibitive tax on phosphorus matches, supervision of the manufacture and sale of foods and drugs, and more recently the prohibition of the interstate shipment of unlabeled lye and caustic products. We know that our proposals will be bitterly attacked as interferring with "States' Rights," but they are essential to a National Program of Health Protection and must be fought for with every resource at Labor's command.

Other measures must take their course through 48 State legislatures. The prospect is not encouraging. Experience with compensation legislation, with efforts to reduce the hours of work for women, with child labor laws, have taught us the difficulty of winning labor legislation in the face of the organized opposition of employers' lobbies, aided by the petty politicians they have put into office. The difficulty of the task cannot discourage us. Provisions already on the statute books must be amplified and strengthened until every State has a Labor Code, guaranteeing safety and health to workers in factory, mill, and workshop. Every State legislature must feel the strength of Labor's power in a concerted nation-wide demand for adequate protection on the job.

As part of our program, Trade Unions must work for equal and, wherever possible, majority representation on all Industrial Commissions and Committees appointed to recommend Labor Codes. The mere passage of laws is not enough. A Trade Union Safety Program for shop trades must include a sufficient number of trained inspectors to enforce these laws.

State and city inspectors must be supplemented by union inspectors. Just as the unions now have their business agents to report violations of agreements in regard to wages and hours, and just as the union stands ready to call workers out on strike where these agreements are violated, so union safety inspectors must see that employers comply with safety regulations and the union must be prepared to call workers out on strike where shops are unsafe.

Organized Labor does not need to wait for legislators to act. It has the power to demand safety on the job at once. Union Committees in every trade must get to work, formulating Safety Standards, to be included in every trade agreement. A number of unions have already adopted health and safety provisions in their agreements. No trade union has an adequate complete safety and health code for the protection of all its members. Side by side with the demand for adequate

wages and shorter hours of work, must be placed the demand for safe working conditions. Every worker must be educated to the dangers of his trade and must learn to turn to his union for the control of these dangers.

In those trades where union organization is still weak, facts describing unsafe conditions and union proposals for the control of those conditions, must rally unorganized workers to the union ranks. Every explosion, every fire, every case of poisoning in a non-union plant, must be used to point out to unorganized workers, that they can expect no protection when they stand as individuals against the organized power of the employers.

Organized Labor now has its own Trade Union Health organization prepared to assist in securing Health Safeguards for workers in shop trades. The Workers' Health Bureau recommends the appointment from this conference of a Shop Trades Safety Committee, to carry out the proposals herewith submitted. The Workers' Health Bureau pledges this Committee its co-operation and the full strength of its resources.

NOTE:—The Conference unanimously endorsed the appointment of a National Trade Union Safety Standards Committee for Shop Trades to work out National Standards for Protection in co-operation with the Workers' Health Bureau.



Berlin, 6. Juni 94. der Verf.

(Separatabdruck aus der Hygienischen Rundschau 1894. No. 11.)

Die dritte Conferenz der Centralstelle für Arbeiterwohlfahrtseinrichtungen.

Am 7. und 8. Mai d. J. tagte zu Berlin in den Conferenzsälen des Anhalter Bahnhofs die dritte Conferenz der Centralstelle für Arbeiterwohlfahrtseinrichtungen. Mit der Conferenz war eine Ausstellung verbunden, deren Gegenstände zu dem Thema des zweiten Verhandlungstages (Reinhaltung der Luft in Fabrikräumen) in Beziehung standen. Es soll zuerst über die Ausstellung referirt werden, da die Redner des öfteren auf Ausstellungsgegenstände verweisen.

I. Die Ausstellung.

Die Ausstellung war in der Zeit vom 2.—9. Mai täglich von 9 Uhr Morgens bis 7 Uhr Abends dem allgemeinen Besuch unentgeltlich geöffnet, der Besuch war ein guter. Die Zahl der Ausstellungsgegenstände sollte planmässig eine beschränkte sein, und es erfolgten nur private Einladungen an die Aussteller; in den Absichten der Geschäftsführung der Centralstelle lag es nicht, eine freie Concurrenz zu eröffnen, sondern „von dem vorhandenen Guten womöglich nur das Beste heranzuziehen".

Ein Catalog der ausgestellten Gegenstände war nicht vorhanden, letztere waren durch beigelegte Zettel kenntlich gemacht, die aber theilweise (wohl aus Versehen nachträglich von Seiten des Publikums) verwechselt waren. So bemerkte Referent den Wolpert-Sauger als „Apparat zum Auffangen und Filtriren von Quecksilber" bezeichnet.

Weitaus am meisten ausgestellt hatte das hiesige Hygiene-Museum, unter anderem an Zeichnungen: Blechjalousien zum Schutze der Arbeiter gegen die Hitze an Zinköfen; staubfreie Packung von Cement in der Cementmühle; Exhaustion von Staub in Nadelschleifereien; Apparat zum Auffangen und Filtriren von Quecksilber an den Belegstellen; Exhaustion von Bleidämpfen; Pläne von Spinnereien; eine Zeichnung, veranschaulichend die Wirkung des Wolpert-Saugers; mehrere Tafeln zur Ventilation; Photogramme verschiedener Arten gesundheitsschädlichen Staubes; ferner an Apparaten: die bekannten Rauch- und Luftsauger von A. Wolpert (Nürnberg), Brüning (Marburg) und Keidel (Berlin); verschiedene Wasserstrahlventilatoren, Lüftungsfenster, eine Probe gelochten Bleches zum Lufteinlass u. s. w. und an Modellen unter anderem einen Hutstaffirsaal mit Hutabreiberei.

Die Sammlung für Gewerbehygiene der hiesigen Technischen Hochschule war durch einige vorzüglich ausgeführte, aber theilweise unvortheilhaft aufgestellte Modelle vertreten. Vor Allem das aus dem bestens bekannten Institut von J. Schroeder in Darmstadt stammende Modell einer Thomasschlackenmühle (Anlage der Gebrüder Stumm in Neunkirchen), bis in die Details mustergültig durchgearbeitet und anscheinend mit wirklichem Triebwerk ausgestattet, hätte nicht an eine Wand gestellt, sondern freie Besichtigung von jeder Seite gestatten sollen. Weiter waren noch an Modellen ausgestellt von der Technischen Hochschule: Verpackungsraum einer Cementfabrik, aus der Modellwerkstatt von C. & F. Schönemann in Berlin; Einrichtung zum

Absaugen der Säuredämpfe beim Metallbrennen (durch eine von der Decke des Raums nach aussen in die Höhe geführte Röhre, in welcher nächst der Decke durch Handbetrieb oder Fabriktransmission ein Radgebläse rotirt), aus der gleichnamigen Werkstatt.

Das Gewerbehygienische Museum in Wien hatte das elegant gearbeitete und gut montirte Modell einer Aufsaugevorrichtung für Holzspähne und Staub bei Holzbearbeitungsmaschinen eingesandt (Fabrikant der Vorrichtung: F. Ringhoffer in Smichow bei Prag). Das Modell konnte in Betrieb gesetzt werden, und man sah, wie ein Exhaustor die bei der Arbeit an Kreissäge, Bandsäge, Abrichtmaschine u. s. w. abfallenden Sägespähne aspirirte und aus einer Sammelröhre nach der Spähnekammer auswarf, wo dieselben in der Praxis dann unmittelbar als Brennmaterial benutzt werden. Ringhoffer selber hatte das Modell eines Schmiedefeuers mit Asbest-Schutztafeln geschickt, wie dieselben bei seinen 200 Schmiedefeuern seit mehreren Jahren mit bestem Erfolge in Gebrauch sind. Diese Schutztafeln bieten offenbar hygienische Vortheile, sowohl was die Minderung der Belästigung durch strahlende Wärme, als auch durch Rauch anlangt, und dürften besonders im Sommer gerne benutzt werden.

Die Färberei von W. Spindler in Spindlersfeld bei Berlin brachte Pläne und Diagramme. In den Diagrammen giebt je eine Curve das Monatsmittel der Aussen- und Innentemperatur (Gebäude No. 4) von 1873—1888 an. Die Curve für die Innentemperatur zeigt vom Sommer zum Winter regelmässig einen Abfall von 10—15° R., z. B.

August 1880: Innentemperatur 20° R.
Januar 1881: „ 5° R.

Für gewöhnlich sind die Mittel der Sommermonate, etwa Mitte April bis Mitte August, für den Innenraum um 1 bis über 2° R. tiefere als für das Freie (z. B. Juli 1880: im Innenraum 19,5° R., im Freien 21,5° R.); nur die Jahre 1873, 1874, 1875, 1888 ergeben durchweg, auch im Sommer, höhere Monatsmittel für den Innenraum.

Wasserstrahlventilatoren, den sogenannten „Aërophor", sowie einen neuen patentirten Luftfeuchter für Spinnereien demonstrirte die hiesige Firma Treutler & Schwarz (S., Dresdener-Str. 80). Der Aërophor ist ein kleines Radgebläse, welches unmittelbar durch einen das Aufschlagwasser von der Wasserleitung erhaltenden Wassermoter getrieben wird. Es ist dies dasselbe Princip, welches dem „Kosmosventilator" der hiesigen Actiengesellschaft Schäffer & Walcker zu Grunde liegt. Diese Gebläseformen haben keinen grossen Wirkungsgrad und eignen sich nur für die Bewegung kleinerer Luftmengen: auch sind die Betriebskosten verhältnissmässig gross, wenn Wasser aus einer städtischen Wasserleitung benutzt wird und der Preis dieses Wassers hoch ist, aber die Einfachheit der Aufstellung und des Antriebes rechtfertigen in vielen Fällen die Anwendung solcher Gebläse. Was den neuen Luftfeuchter von Treutler & Schwarz anlangt, so besteht dessen Princip darin, dass eine eigenthümlich construirte Düse aus einer Höhe von mehreren Metern einen äusserst feinen Nebel versendet; die Firma garantirt angeblich für einen constanten Feuchtigkeitsgehalt von 60—85 pCt.

David Grove in Berlin hatte eine Luftbefeuchtungsvorrichtung ausge-

stellt, bei der ein langgestrecktes flaches Wasserschiff anscheinend von Heisswasserschlangen, die wohl Maschinen-Abwasser zu führen bestimmt sind, durchsetzt wird; ferner einen Blackman'schen Ventilator und einen grossen quadratischen Sauger (von ca. 40 cm Querschnitt).

A. Claus & Cie (S., Blücherstr. 31) brachte „Victoria-Ventilatoren", Patent M. Lutzner. Der Victoria-Ventilator enthält eine Brause, die mit schräg gegen einander gerichteten feinen Canälen versehen ist; die austretenden Wasserstrahlen treffen sich in einem Punkte und zerstäuben dadurch. Diese Apparate werden auch so gebaut, dass in die beiden Schenkel einer U-förmigen Blechröhre je eine solche Brause eingesetzt wird; das Blechgehäuse wird einerseits mit dem zu lüftenden Raume, andererseits mit der Aussenluft verbunden. Je nachdem nun der Hahn an der einen oder anderen Brause geöffnet wird, erfolgt Lufteinführung oder Luftabsaugung.

Maschinenfabrik und technisches Bureau von G. Hambruch (SW., Wilhelmstr. 124) war als Licenzinhaber des D. R.-P. 24230 durch die von Boyle construirten und „Luftpump-Ventilatoren" benannten Saugköpfe vertreten. Dieselben sind feststehend, nicht beweglich und nach den gemachten Erfahrungen von guter Wirkung, also wohl zu empfehlen; aber sie sind wesentlich theurer, als die anderen Sauger, es kostet z. B. die Grösse für einen Röhrendurchmesser von 20 cm über 60 Mark, die Maximalgrösse für 67½ cm Röhrendurchmesser etwa 470 Mark.

Andere Aufsätze englischen Systems, die von Alland, welche W. Hanisch & Co. (Oranienburger-Str. 65) ausstellten, sind dadurch gekennzeichnet, dass in der Abluftröhre ein Schraubenventilator gelagert ist, der durch ein auf gleicher Achse sitzendes, vom Winddruck in Drehung versetztes Rad bewegt wird und somit eine Saugwirkung hervorruft. In Folge der Beweglichkeit der Theile ist bei diesem Schlotaufsatz, wie übrigens bei allen drehbaren Einblas- und Saugköpfen der Uebelstand vorhanden, dass diese Beweglichkeit durch Eis und Schnee, bei stark verunreinigter Abluft oder Aussenluft auch durch Russ und Staub leiden und schliesslich ganz aufhören kann, sodass sogar eine Hemmung des Abzugs nicht ausgeschlossen ist. Eine fernere Construction eines drehbaren Saugkopfes, ebenfalls von Hanisch ausgestellt, mit Windfahne ausgerüstet, zeigte zu $^3/_4$ des Umfanges den Wolpert'schen Saugkessel und war zu ¼ offen; versagt die Drehbarkeit, so kann, wegen der theilweisen Oeffnung des Saugkessels, von oben kommender Wind auf die bequemste Weise in den Kamin gelangen; es tritt ein Rückstau im Kamin ein, welcher eine Rückwärtsbewegung der Abluft zur Folge hat. Ein guter Sauger soll überhaupt nicht drehbar construirt sein und von den feststehenden sind diejenigen die besten, welche sich erstens nicht leicht durch Eis, Schnee und Russ verstopfen (diese Möglichkeit ist bei vielen sonst guten Constructionen vorhanden), und welche zweitens, mit anderen Saugern verglichen, für die ungünstigste Windrichtung die relativ grösste saugende Wirkung ergeben, niemals aber den Wind in den Kamin hinein gelangen lassen; der relativ grösste Saugeffect bei günstigen Windrichtungen kann kein Kriterium bilden. Ausserdem waren von Hanisch noch ausgestellt Aschen-, Russ- und Funkenfänger.

Nur durch Zeichnungen ihres Exhaustionssystems vertreten war die B. F. Sturtevant Cie. in Boston, welche in Nordamerika in der Ausführung von Heizungs- und Lüftungsanlagen einen besonders guten Ruf besitzt und seit einiger Zeit auch in Deutschland vertreten ist (Vertreter Jakob Geub in Köln-Ehrenfeld). Durch Gebläse lassen sich grosse Luftgeschwindigkeiten hervorbringen, die den erheblichen Vortheil gegenüber geringer Geschwindigkeit haben, dass sie kleine Canalquerschnitte ergeben, welche verhältnissmässig leicht unterzubringen sind. In Deutschland werden gewöhnlich Geschwindigkeiten von 2—3 Meter in der Secunde angenommen und das Gebläse wird hiernach berechnet; ausnahmsweise wird bis zu 4 Metern gegangen. Die Sturtevant Cie. verwendet für die Luftleitungen Geschwindigkeiten bis zu 15 Metern. Den grösseren Betriebskosten bei der Benutzung enger Canäle stehen die grösseren Anlagekosten und unter Umständen bauliche Schwierigkeiten bei der Anbringung weiter Canäle gegenüber.

Civilingenieur und Mühlenbaumeister W. F. L. Beth aus Lübeck demonstrirte seinen durchaus zuverlässig construirten Mühlenstaub-Exhaustor mit schlauchförmigen Saugefiltern zum Ersatz der Staubkammern, der Apparat zeichnet sich aus durch einen einfachen Mechanismus und eine niedrige Tourenzahl; Fabrikbesitzer Dr. Karl Möller aus Brackwede (in Firma K. und Th. Möller), sein neues System der Luftentstaubung mit Zuhilfenahme der Circulation; die Firma Bernhard Loeb jr. (N., Fehrbelliner-Str. 47), ihre patentirten Respiratoren.

Von Hygrometern waren nur zwei Constructionen, beide von Wilhelm Lambrecht in Göttingen und beides neue Ausführungen, zu sehen. Das Lambrecht'sche Haarhygrometer, sogenanntes „Polymeter“ zeigt nicht mehr eine gleichtheilige, sondern eine gegen den Sättigungspunkt hin stark abnehmende Scala. Das Lambrecht'sche „Aspirations-Psychrometer“ tritt zum ersten Mal hier auf der Ausstellung vor die Oeffentlichkeit; die Aspiration erfolgt durch Handbetrieb auf höchst einfache und sinnreiche Weise. Beide neuen Instrumente sind, im Vergleich mit mehreren anderen Constructionen, recht zuverlässig; auch der Zeitaufwand bei Benutzung des Aspirations-Psychrometers ist kein nennenswerther. Nach Ansicht des Referenten, der im März d. J. Gelegenheit hatte, die beiden Instrumente neben anderen Constructionen mit der Absorptions- und Wägemethode zu vergleichen, wird das neue Aspirations-Psychrometer die übrigen Psychrometer verdrängen.

Aus der grossen Zahl der Apparate zur Luftprüfung auf Kohlensäure war nur einer ausgestellt, der vom Referenten 1888 angegebene, von Ferdinand Ernecke (SW., Königgrätzer-Str. 112).

II. Die Conferenz.

Auf der Tagesordnung des ersten Verhandlungstages stand: „Das Sparkassenwesen in seiner Bedeutung für die Arbeiterwohlfahrt“, während dem zweiten Tag eine Besprechung des Themas: „Die Reinhaltung der Luft in Fabrikräumen“ vorbehalten war. Da nur das letztere Thema von unmittelbarem hygienischen Interesse ist, so soll hier nur über den zweiten Verhandlungstag referirt werden.

Zunächst sprach Stabsarzt Dr. Wutzdorff (kommandirt zum Kaiserlichen Gesundheitsamt) über: **„Hygienische Anforderungen an die Luftbe-**

schaffenheit". Die Ausführungen des Redners waren in Kürze folgende. Die gesundheitsschädigenden Beimengungen der Luft können gasförmiger oder fester Natur sein. Die Erfahrung hat gelehrt, dass in Wohnräumen Luft, welche mehr als 1 Raumtheil Kohlensäure auf 1000 enthält, Kopfschmerz, Schwindelgefühl und Uebelkeit veranlasst, bei dauerndem Aufenthalt zu Blutarmuth führt und so die Empfänglichkeit für innere Erkankungen vermehrt. Allerdings ist diese Wirkung nicht der Kohlensäure zuzuschreiben, sondern giftigen Gasen, welche neben der Kohlensäure in von Menschen überfüllten Räumen sich bilden und erfahrungsgemäss in ihrer Ansammlung mit der Vermehrung des genannten Gases durch die Athmung gleichen Schritt halten. Die Menge der in einem Raume sich bildenden Kohlensäure gilt daher im Allgemeinen als Maassstab für die Verunreinigung der Raumluft und ist als solcher von grosser Bedeutung für die Berechnung des Ventilationsbedarfs. In einfacher Weise lässt sich der Ventilationsbedarf im Allgemeinen berechnen nach der Formel:

$$\frac{22{,}6 + x \times 0{,}0003}{x} = \frac{1}{1000};$$

ein Erwachsener giebt nämlich in der Stunde 22,6 Liter Kohlensäure an die Luft seines Anfenthaltsraumes ab. Der stündliche Ventilationsbedarf des Erwachsenen stellt sich demnach auf etwa 32 cbm und für eine stündlich 2 bis 3-malige Lufterneuerung der jedem Erwachsenen in Wohnräumen zuzumessende Luftraum auf mindestens 10—16 cbm; bei Beleuchtung hat man in Betracht zu ziehen, dass eine Petroleumlampe stündlich 60, eine Gasflamme 100 Liter Kohlensäure liefert. Gesetzliche Bestimmungen im Deutschen Reich nach dieser Richtung, sind nur für die Cigarren- und Zündhölzerindustrie erlassen worden: Minima von 7, beziehungsweise 10 cbm Raum für jeden Arbeiter.

Wichtiger noch als die Aufstapelung der Kohlensäure und der sie begleitenden Gase in der Luft ist die Verunreinigung der Luft mit Staub, den wir, wenn ein Sonnenstrahl in ein verdunkeltes Zimmer fällt, als sogenannte Sonnenstäubchen wahrnehmen. Auf leichte Weise kann man den Luftstaub auch durch den John Aitkin'schen Versuch zur Anschauung bringen. Man bedient sich dazu einer farblosen Glasflasche, deren doppelt durchbohrter Stopfen zwei Glasröhren und an einer derselben einen Gummischlauch trägt. Man füllt die Flasche mit Wasser, begiebt sich in den zu untersuchenden Raum, giesst hier das Wasser aus, um Luft in die Flasche einströmen zu lassen, schliesst mit dem Finger die offene Glasröhre und verdünnt durch kräftiges Saugen am Gummischlauch die in der Flasche befindliche Luft. Dadurch verdampft das an der Flaschenwand noch haftende Wasser und in diesem Wasserdampfe macht sich der Staub in Gestalt eines Nebels sichtbar; derselbe verschwindet sofort, wenn man den negativen Druck aufhebt.

Nach ihren Folgen für die Gesundheit können wir die staubförmigen Beimengungen der Luft eintheilen in:

1. Solche Staubsorten, welche an und für sich giftig sind;

2. solche Staubsorten, welche krankheitserregende Keime mit sich herumführen, und

3. solche Staubsorten, welche durch ihre körperliche Beschaffenheit die

Gewebe des menschlichen Körpers, mit welchen sie in Berührung treten, verletzen oder reizen und so zur Erkrankung Veranlassung geben.

Die Staubsorten, welche an und für sich giftig sind, entwickeln sich hauptsächlich bei der Blei-, Quecksilber- und Arsenindustrie. Der Luftstaub kann aber auch ansteckende Krankheitskeime enthalten, unter ihnen stehen die Tuberkelbacillen obenan. Der Auswurf der Phthisiker enthält sie in grossen Mengen, und wenn derselbe Gelegenheit hat auszutrocknen und zu zerstäuben, so liegt für die im selben Raume mitbeschäftigten Arbeiter die Gefahr vor, die Tuberkelbacillen einzuathmen und ebenfall an Phthise zu erkranken. Die Pocken werden zuweilen beim Lumpensortiren von dem Arbeitsmaterial aus übertragen; Milzbrand und Rotz in Woll- und Rosshaarfabriken, Gerbereien, Kürschnereien und Pinselfabriken. Als Untersuchungsmethoden kommen in Betracht die Verfahren von Hesse, Emmerich und Petri. Die noch übrigen Staubsorten haben, wenngleich nicht alle in demselben Grade, eine mehr mechanische Wirkung mit einander gemein; sie reizen, verletzen, führen zur Entzündung, die bei stetig sich erneuerndem Reiz chronisch werden kann, sie bereiten Krankheitskeimen den Boden vor, auf dem sich dieselben einwurzeln und gedeihen. Je schärfere Kanten und Spitzen eine Staubsorte hat, desto gefährlicher ist sie. Die Hauptgefahr besteht für das Lungengewebe. Auf der Basis eines chronischen Bronchialkatarrhs entsteht mit Vorliebe, durch mit den Staubtheilchen eingedrungene Krankheitskeime, das Krankheitsbild der Pneumonie und vor allem der Phthise.

Als zweiter Redner spricht Regierungsrath Professor Konrad Hartmann (ständiges Mitglied des Reichsversicherungsamtes) über: **„Technische Mittel zur Reinhaltuug der Luft“**. Die Beschaffung guter Luft ist eine der vornehmsten Aufgaben, welche die wissenschaftliche Hygiene der Gesundheitstechnik stellen kann. Redner theilt die verschiedenen Mittel zur Reinhaltung der Luft von Arbeitsräumen in vier Gruppen:

Erstens Mittel, durch welche eine ausreichende Lüftung erzielt wird;

zweitens Mittel, durch welche Gase, Dämpfe, Staub, Rauch an der Entstehungsstelle durch unmittelbare Ableitung und andere Mittel beseitigt oder unschädlich gemacht werden und abgeleiteter Staub und dergleichen abgeschieden wird;

drittens Mittel, durch welche die bei der Lüftung einzuführende und abzuleitende Luft gereinigt werden kann, und

viertens Mittel, durch welche der nothwendige Feuchtigkeitsgrad der Luft erzeugt wird.

1. Lüftung der Arbeitsräume.

Die Lüftung ist entweder eine natürliche, unregulirbare, wie sie durch Temperaturunterschied der Innen- und Aussenluft und durch Windanfall hervorgebracht wird, oder aber eine künstliche, regulirbare. Es wäre ungerechtfertigt, für alle Arbeitsräume die Herbeiführung eines bestimmten Luftwechsels durch künstliche Einrichtungen zu verlangen. Für grosse, von einer verhältnissmässig geringen Zahl von Arbeitern besetzte Räume, und wenn die Aussenluft rein ist, wird die natürliche Lüftung einen ausreichenden Luftwechsel geben können, der die Raumluft thatsächlich rein erhält. Aber es ist zweifellos, dass für zahllose Arbeitsräume die hygienischen Anforderungen

an die Luftbeschaffenheit durch natürliche Lüftung nicht erfüllt werden. In den Berichten der Gewerbeaufsichtsbeamten findet sich häufig die Klage, dass in den Kreisen der Arbeitgeber wenig Neigung bestehe, eine ausreichende Lüftung ihrer Arbeitsräume zu schaffen. An technischen Mitteln zur Erreichung dieses Zieles fehlt es nicht, aber Unkenntniss und Unverständniss dieser Mittel, Indolenz und Sparsamkeit führen vielfach dazu, dass von solchen künstlichen Lüftungseinrichtungen kein Gebrauch gemacht wird. Es darf allerdings nicht verschwiegen werden, dass auch häufig ein berechtigtes Misstrauen gegen solche Einrichtungen vorhanden ist; dieselben geben nicht alle gute Resultate, und es bestehen genug Lüftungsanlagen, die in Folge falscher Anordnung die beabsichtigte Wirkung nicht ergaben und daher wieder ausser Betrieb gesetzt worden sind.

Redner giebt alsdann ein sehr eingehendes Bild der verschiedenen technischen Mittel zur Lüftung, von den Lüftersteinen und Lochscheiben angefangen bis zum Luftstrahlgebläse mittels Druckluft; Sauger werden nur feststehende empfohlen und als zweckentsprechende Constructionen namhaft gemacht die Apparate von Professor Dr. A. Wolpert in Nürnberg (Eisenwerk Kaiserslautern), von Baumeister Brüning in Marburg (Eisenwerk Lauchhammer), von Käuffer u. Cie. in Mainz, von H. Kori in Berlin, von W. Born in Magdeburg, von Alexander Huber in Köln, von R. Boyle u. Cie. in London (G. Hambruch in Berlin), von Hill u. Hay in Halifax (Baumeister Ferd. Bernatz in Jouy aux Arches bei Metz).

Die Wahl der Lüftungsart betreffend, ist die Entscheidung der Frage, ob Saug- oder Drucklüftung oder beides zugleich angeordnet werden soll, ausschlaggebend. Die Lüftung allein durch Absaugen der verunreinigten Luft zu bewirken, ist nur dann zweckmässig, wenn sicher darauf gerechnet werden kann, dass die in die Arbeitsräume in Folge des in ihnen entstehenden Unterdrucks eindringende Luft rein ist, also von Orten stammt, woselbst eine Verunreinigung ausgeschlossen ist. Diese Bedingung wird aber in den allerseltensten Fällen erfüllt sein, meistens wird die eindringende Luft ganz oder theilweise zweifelhafte Beschaffenheit haben. Jedenfalls sollte, wenn aus Gründen der Sparsamkeit die Räume nur mit Abzugskanälen versehen werden, wenigstens eine unmittelbare Zuführung der Aussenluft durch Kanäle, welche die Aussenwände durchdringen, ermöglicht sein. Die Drucklüftung giebt im allgemeinen bessere Resultate als die Sauglüftung. Jedoch ist darauf zu achten, dass in aneinanderliegenden Arbeitsräumen nicht verschiedener Ueberdruck entsteht, da sonst wieder Luft, die bereits verunreinigt sein kann, aus einem Raum in den andern tritt; ferner ist zu verhindern, dass durch Luftströme, welche in den gelüfteten Räumen, oder bei offenstehenden Thüren auch in den Treppenhäusern und dergleichen entstehen, eine Saugwirkung auf Räume wie Aborte ausgeübt wird, welche Verunreinigungen zuführt. Drucklüftung kann nur durch Anwendung von Gebläsen erzielt werden. Zumeist wird es bei der Anordnung der Drucklüftung ausreichen, nur frische Luft zuzuführen und die verunreinigte Raumluft durch Undichtheiten der Raumumschliessung entweichen zu lassen, wenn nämlich nicht die Gefahr besteht, dass die entweichende Luft in andere Arbeits- oder Geschäftsräume eindringen kann.

Eine Prüfung der Lüftungsanlagen auf ihre Wirksamkeit hat nicht nur unmittelbar nach geschehener Herstellung, sondern auch noch später von Zeit zu Zeit zu geschehen. Die Messung der Luftgeschwindigkeit in einem Kanal mittels des Anemometers, hat an mehreren Stellen des Kanalquerschnittes zu erfolgen und es ist das Mittel zu nehmen. Auch von der ständigen Ventilations-Controlvorrichtung nach Ingenieur Hermann Recknagel in Winterthur (Fabrikant G. Häni in Winterthur), kann vortheilhaft Gebrauch gemacht werden. Zur Prüfung der Luft auf ihren Kohlensäuregehalt könne die Pettenkofer'sche Methode, welche Uebung erfordere, verwendet werden, doch gebe auch die 1888 vom Referenten angegebene Methode Resultate, welche für die Praxis in den meisten Fällen ausreichend genau seien.

2. Absaugung und Unschädlichmachung von Staub, Rauch, Gasen und Dämpfen.

Besondere Verunreinigungen der Luft sollen womöglich an der Entstehungsstelle abgefangen oder unschädlich gemacht werden, ehe sie in die Luft des Arbeitsraumes eintreten können. Durch die hierzu in Anwendung gebrachten Mittel werden diese Verunreinigungen entweder abgeleitet, oder niedergeschlagen. Die Luftverunreinigungen dieser Art bilden häufig ein werthvolles Product, dessen Wiedergewinnung einen beträchtlichen Gewinn abwirft.

Ein vollständiger Abschluss des Apparats von der Raumluft dergestalt, dass es nur eines Ableitungsrohres bedarf, ist, mehr oder weniger leicht, vielfach möglich, unter anderem bei Zerkleinerungsmaschinen, Reibmaschinen, Mischmaschinen, Absiebeeinrichtungen, Pulverisirmühlen, Mahlgängen, Kugelmühlen, Desintegratoren, Lumpendreschern; manchmal auch bei Schmelzkesseln, Kochern, Einrichtungen zum Dämpfen, Beizen, Destillir-, Rectificir-, Extractionsapparaten, Russerzeugungseinrichtungen, Brennöfen u.s.w.; zuweilen auch bei Transport- und Verpackungseinrichtungen für pulverförmige Stoffe.

Ein theilweiser Abschluss des Apparats von der Raumluft dergestalt, dass im Bedarfsfalle für kurze Zeit eine Oeffnung hergestellt wird, welche gross genug ist, um die Bedienung zu erlauben, ist möglich unter anderen bei Schleif- und Schmirgelmaschinen, Polirmaschinen, Stampfen, Sägen, Holzbearbeitungsmaschinen, Krempeln, Karden, Rauhmaschinen, Hecheln, Rosshaarzupfmaschinen, Fadenputzmaschinen, Schmiedefeuern, Tunkapparaten für Phosphormasse, Siedepfannen.

Wo auch kein theilweiser Abschluss des Apparates von der Raumluft möglich, kann vielfach durch eine kräftige Aspiration und zweckmässige Lage der Aspirationsöffnung (letztere am besten dicht an den Theilen der Maschine, an welchen die Staubentwicklung u. s. w. auftritt) geholfen werden, unter anderem z. B. bei manchen Maschinen der Textilindustrie, bei Holzbearbeitungsmaschinen, Hutschleifmaschinen, Hadernsortirtischen, Quecksilberbelegen.

Sind die entwickelten Gase oder Dämpfe brennbar, so empfiehlt es sich, sie in Feuerungsanlagen einzuleiten und sie durch Verbrennung unschädlich zu machen. Der Zug der Feuerung bewirkt dabei die Absaugung der Gase und Dämpfe. Abgeleitete Dämpfe können manchmal durch

Wasser condensirt werden. Die Beseitigung des in Färbereien, Trockeneinrichtungen u. s. w. entstehenden Wasserdampfes erfolgt meistens durch zugeleitete warme Luft, die in Folge ihrer höheren Temperatur Wasserdampf in sich aufzunehmen vermag; die Luft wird nachher durch Schlote, Röhren ins Freie geführt.

3. Reinigung der einzuführenden und abzuleitenden Luft.

An den Luftentnahmestellen sind stets engmaschige Drahtgitter oder feingelochte Bleche anzubringen, zur Abscheidung grober Staubtheile und dergleichen. Auch minder grober Staub setzt sich bereits in eingeschalteten Staubkammern nieder, indem die Luft beim Durchströmen eines solchen weiten Raumes eine sehr geringe Geschwindigkeit annimmt (die Widerstände sind nahezu proportional dem Quadrate der Geschwindigkeit). Feineren Staub kann nur eine Reinigung der Luft durch Wasser, oder eine Reinigung der Luft durch Gewebefilter entfernen.

Fast durchgehends Gewebefilter werden benutzt zur Reinigung der abzuleitenden Luft. Der abgefangene Staub bildet häufig, wie bei Mühlen der verschiedenen Art, ein werthvolles Product. Oefter, als die gesammte Raumluft aufzunehmen und zu filtriren, haben solche Entstaubungsanlagen die Aufgabe, die von den stauberzeugenden Arbeitsmaschinen und Apparaten unmittelbar abgeleitete Luft zu reinigen. Besonders in der Mühlenindustrie haben sich solche Entstaubungsanlagen eingeführt, sodass heute kaum mehr eine grössere Mühle für Getreide, Reis, Cement u. s. w. ohne eine solche Anlage gebaut wird. Zu den bewährten Constructionen dieser Art gehören diejenigen von Nagel u. Kaemp in Hamburg, G. Luther in Braunschweig, Fr. Hausloh in Hamburg, Eugen Kreiss in Hamburg, W. F. L. Beth in Lübeck, K. u. Th. Möller in Brackwede, Unruh u. Liebig in Leipzig, M. Martin in Bitterfeld. Da mit der Staubablagerung der Widerstand des Filters erheblich wächst, so hat des öfteren eine Reinigung der Filtertücher stattzufinden, wozu diese gerüttelt, geklopft, umgestülpt werden; bei mehreren Constructionen wird auch ein Luftstrom in umgekehrter Richtung durch das Filter geführt, der dann den abgelagerten Staub abbläst. Diese Bewegungen erfolgen bei fast allen genannten Filterformen selbstthätig durch mechanische Vorrichtungen, deren Antrieb von der Fabriktransmission oder von der Welle des mit dem Staubsammler gewöhnlich verbundenen Sauggebläses abgeleitet wird.

Neuerdings hat Dr. Karl Möller für Entstaubungsanlagen, durch welche wie z. B. bei der Textil- und Tabaksindustrie die gesammte Raumluft behufs Reinigung geführt werden soll, ein Röhrenfilter construirt. Aus öconomischen Gründen will Möller für die Winterlüftung der Arbeitssäle die gereinigte Luft ganz oder theilweise in die Arbeitsräume zurückführen, im Sommer soll die gereinigte Luft ins Freie ausströmen.

4. Befeuchtung und Trocknung der Luft.

Nur eine geringe Wasserverdunstung bewirken aufgestellte flache Schalen. Bessere Wirkung haben benetzte Tuchflächen. „Hierbei wird das Tuch nach der Angabe von Dr. H. Wolpert (1887) als Rollhang so angebracht, dass es mit dem oberen Ende über eine Walze gewickelt ist, welche in einem Wassergefäss liegt und von aussen gedreht werden kann, sodass das herab-

hängende Tuchstück sich aufrollen lässt, um die Verdunstungsfläche nach Bedarf einzustellen.“ In Schweizer Fabriken finde sich eine ähnliche Einrichtung, bei welcher das Tuch als endloses Stück über zwei, in einem hohen Gestell übereinander gelagerte Walzen gezogen ist. Die untere Walze läuft in einer mit Wasser gefüllten Rinne, die obere wird von der Fabriktransmission aus in langsame Drehung versetzt, wodurch das Tuch stets beim Passiren des Wassergefässes Wasser aufsaugt. Offenbar ist aber die Regulirung der zu verdunstenden Wassermenge bei dieser Vorrichtung nicht ganz so einfach wie bei dem vom Referenten „Regulirbarer Verdunstungs-Rollhang“ genannten und übrigens von ihm nur zur Anwendung an der Seitenfläche eines geheizten Ofens empfohlenen Apparat, bei welchem auf die bequemste Weise jeden Augenblick die Verdunstungsfläche, innerhalb weiter Grenzen, bedeutend vergrössert und verkleinert werden kann. Für Spinnereien und Webereien dürften jedoch solche Verdunstungstücher (auch nach Ansicht des Referenten) nicht genug ausgeben, hier empfehlen sich mehr die erprobten Einrichtungen von ten Brink und von C. Mehl, bei welchen beiden die den Arbeitsräumen zugeführte Luft von Radgebläsen durch eigenartig eingerichtete Wasserkästen gesaugt wird. Auch bei dem Befeuchtungsapparat von Schmid u. Köchlin, der besonders in Elsässer Webereien Verbreitung gefunden hat, kommt ein Schraubenradgebläse zur Anwendung. Streudüsen, aus denen unter Druck stehendes Wasser äusserst fein zertheilt austritt, verfertigen z. B. Gebrüder Körting in Körtingsfeld bei Hannover. In grossen Luftkanälen werden häufig Wasserbrausen angebracht. Dampf wird selten zum Befeuchten angewendet, da hierbei eine Erwärmung der Luft entsteht, solche Einrichtungen also nur für den Winter brauchbar sind, und weil Dampf leicht der Luft einen unangenehmen Geruch giebt.

Zur Trocknung der Luft wäre die Anwendung transitorischer künstlicher Kühlung sowie bestimmter Chemikalien denkbar. In der Praxis das beste Trocknungsmtitel, wenn z. B. Wasserdämpfe zu beseitigen sind, die nicht unmittelbar an der Entstehungsstelle abgefangen und abgeleitet werden können, ist und bleibt jedoch eine gute Ventilation.

In der an die Vorträge sich anschliessenden Discussion betont Fabrikbesitzer Dr. Karl Möller (Brackwede) die Bedeutung des Staubgehaltes der Luft speciell für einzelne Betriebe und erklärt sein neues System der Entstaubung. Hofrath Prof. Dr. H. Meidinger (Karlsruhe) spricht über die Stauberzeugung in den Haarschneidereien, beschreibt anschaulich den Betrieb, hält es für schwer möglich, hier staubfreie Luft zu schaffen, und bespricht dann, manche interessante Bemerkung über Ventilation mit einflechtend, eine verfehlte Ventilationsanlage, bei der in einem grossen Versammlungsraum statt vieler kleinerer Abzüge ein einziger grosser von 2—3 qm Oeffnung angebracht sei. Ingenieur Gary (Berlin), Gewerberath Sack (Königsberg i. Pr.), Abgeordneter Sombart (Ermsleben) und Fabrikbesitzer Lidkens (M.-Gladbach), sind einig über die Unzuträglichkeiten der bisherigen Respiratoren zum Schutze der Arbeiter gegen Staub, die Widerstände des Apparats seien zu gross, allgemein nehmen die Arbeiter lieber einen feuchten Schwamm vor den Mund als den Respirator, allenfalls sei

der Respirator da am Platze, wo die Maschine die physische Arbeit ausführe und der Arbeiter nicht viel mehr zu thun habe als die Maschine zu überwachen, sonst aber schwitzten die Arbeiter unter der Belästigung des Respirators. Gewerberath Sack erörtert die Staubverhältnisse in einigen Mühlen. Der Knochenmehlstaub sei ja widerlich wegen des Geruchs, werde jedoch durch die Feuchtigkeit gallertig aufgetrieben, sodass der Mund der Arbeiter wie mit Kleister beschmiert aussehe, sei daher lange nicht so schädlich wie mancher andere Staub. Der allerschädlichste Staub, derjenige, welcher nach den Beobachtungen des Redners sehr viele Pneumonieen hervorrief, sei der Thomasschlackenmehlstaub; besonders bei Neueröffnung von Fabriken mache sich dessen Schädlichkeit geltend. Schliesslich richtet Dr. Albrecht (Lichterfelde) noch einen Appell an die experimentelle Hygiene, doch endlich die Bearbeitung der Frage ernstlich in Angriff zu nehmen, in welchem Maasse die einzelnen Staubarten schädlich seien.

Die Discussion drehte sich lediglich um einen Punkt, um die Staubfrage. Die Anregung Meidinger's, einen Austausch von Erfahrungen auf dem Gebiete der Ventilation in Fluss zu bringen, blieb vereinzelt. Das ist bedauerlich. Allerdings bot die Gründlichkeit und Klarheit der beiden Vorträge einigen Ersatz für das Fehlen der Discussion nach dieser Richtung.

Schliesslich noch einige Bemerkungen für diejenigen, denen etwa die Einrichtung der Centralstelle unbekannt ist. Die Centralstelle für Arbeiterwohlfahrts-Einrichtungen ist eine gemeinsame Gründung von 9 verschiedenen grossen Vereinen, welche sich die Förderung der Arbeiterwohlfahrt zum Zweck gesetzt haben (u. a. des Centralvereins für das Wohl der arbeitenden Klassen zu Berlin, des Vereins zur Förderung des Wohles der Arbeiter „Concordia" zu Mainz, des Vereins „Arbeiterwohl" Verband katholischer Industrieller und Arbeiterfreunde zu M.-Gladbach, des Gesammtverbandes der evangelischen Arbeitervereine Deutschlands zu M.-Gladbach). Die zwölf Vorstandsmitglieder werden theilweise von den betheiligten Vereinen gewählt und theilweise von der Staatsregierung ernannt, wie denn überhaupt die Staatsregierung dem jungen Unternehmen in jeder Weise grosses Interesse entgegenbringt, sodass dasselbe wohl berufen erscheint, Gegensätze zu überbrücken und für die Hebung der Arbeiterwohlfahrt planmässig durch Wort und Schrift, durch Auskunftsertheilung und Anregungen Erspriessliches zu wirken. Das Organ der Centralstelle ist die von Dr. Albrecht redigirte „Zeitschrift der Centralstelle für Arbeiterwohlfahrts-Einrichtungen", welche in Carl Heymann's Verlag, am 1. und 15. jeden Monats, bereits in einer Auflage von 1200 Exemplaren erscheint. Es wäre dringend zu wünschen, dass im Interesse der guten Sache diese Zeitschrift auch in hygienischen Kreisen viele Verbreitung und Mitarbeiterschaft fände.

H. Wolpert (Berlin).



THE INFLUENCE of WORKING ENVIRONMENT on HEALTH and FITNESS

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The Influence of Working Environment on Health and Fitness

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The fresh air, the sunlight, the freedom of movement and vision and the absence of excessive noise and vibration are some of the advantages which the labourer in the fields enjoys and takes for granted, but to his brother or sister in the factory, the shipyard or the mine, engaged in producing manufactured articles or raw materials to meet the needs of our increasingly complex civilisation, such ideal conditions for labour are to a large extent inevitably denied. In the artificial working environment of hot, humid and heavy industries, in the midst of the roar and vibration of rapidly moving machinery, in the dust and fume-laden air of the factory or in the workroom where the execution of the task involves the concentrated and acute visual perception of fine objects, the human body and its organs of special sense may encounter conditions which unduly strain its natural physiological powers and so produce excessive fatigue and increase the liability to accidents or cause disease. Such has been the case in many industries in the past, not only in this country, but in all industrialised communities, and although great advances have been made towards the provision of a physiological opportunity for labour, there is an ever-increasing need for man to control those conditions of work which he has artificially created and so permit essential production without hazard to health and fitness.

Although this paper is limited to considerations of the effects of the physical environment at work on the operative, we must not forget that, in addition, other factors, such as the nature of the work and the method of performance, the rate, rhythm and duration of work and the personal characteristics and life of the individual worker collectively influence his health, fitness and working capacity, and jointly, with working environment, determine whether

the cycle—work, fatigue and recovery[1]—is in balance or out of balance from day to day and week to week.

We could approach the study of the working environment from the physical point of view and consider separately and in detail the temperature of the air and of the solid surroundings, the moisture in the air and atmospheric pressure, ventilation in respect of fresh air entry and air movement and problems of illumination, vibration, noise and atmospheric pollution. If we were to adopt this line of approach we should certainly acquire a great deal of information about the physical environment in industry, but we should be little the wiser in regard to its human significance. In considering the working environment from the physiological point of view it is at once apparent that we must group together those physical characteristics which collectively exert an influence on the human body as a whole, or special functions in particular. It is therefore from the physiological standpoint that I shall endeavour to treat the question of the influence of the environment at work on the health and fitness of the worker.

Some Physiological Considerations

In spite of very varied conditions of heat or cold in the outside world, the temperature of the human body remains, in health, practically constant. This constancy is one of the conditions for health and fitness, for at the temperature we usually regard as normal the intimate chemical and physical processes in living tissues proceed at optimum rates and any material change speeds them up or slows them down unduly or produces reactions inconsistent with normal function. The living body is at all times using energy within itself in the ceaseless activity of the cells of the varied organs and tissues which have specialised functions to perform in the interests of life. Thus, the continuous functioning of the respiratory mechanism ensures that the body can obtain adequate oxygen from the air for the intimate chemical processes which take place in the muscle cells of the heart or of the muscles when used for productive labour or the maintenance of posture, and for the activity of those glands which are concerned with the digestion, absorption and economical utilisation of foodstuffs. All this chemico-physical activity within the body at rest and the increased activity when at work inevitably entails oxidative reactions which liberate heat within the body, and this heat production not only enables the body to maintain its warmth at a temperature compatible with optimum functioning but necessitates the continuous discharge or loss of heat by the body. In other words, there is a physiological necessity for the maintenance of a balance between the heat produced inside the body and the heat lost to its surroundings.

We all know what a rise in body temperature of two or three

degrees means to our sense of well being. We are all really very delicately balanced thermostats, quickly sensitive not only to abnormal heat gain or heat loss but to the particular physical mechanism involved in gain or loss of heat between the body and its environment. Thus. an adult, in ordinary clothing, sitting in a room in still air at a temperature of about 60° F. and 50 per cent. relative humidity, generates within himself some 400 British Thermal Units of heat energy in an hour and loses that heat to the environment in approximately the following proportions: 45 per cent. by radiation to the solid surroundings, which are colder than the surface temperature of the skin or clothing, 31 per cent. by convection and conduction to the air in contact with skin and clothing, and 24 per cent. by the evaporation of invisible perspiration from the skin and moisture from the lungs.

Under such conditions of temperature and humidity an individual accustomed to our external climate may feel comfortable sensations of warmth indoors, but without a certain degree of air movement the air would lack freshness, and without a regular entry of pure air from outside, sooner or later the room air would become unpleasant in odour, at least it would seem so to anyone entering from outside.

Thus, many physical characteristics of the environment are collectively concerned in the heat exchange between the body and its surroundings, and not only determine the proportions in which the heat is lost in the ways mentioned but also our sensations of comfort. If the body cannot lose heat by radiation, owing to the high temperature of the walls and ceilings, as in a lightly constructed workshop in summer weather, then a greater proportion of body heat must be lost by sweating and evaporation, or a fan installed to promote heat loss by convection. On the other hand, if walls and windows are much colder than the air, an unpleasant chilling sensation results, owing to excessive loss of heat by radiation from the body.

The working environment varies widely in different industries as necessitated by the manufacturing process which has to be followed in order to produce the required product, and problems of heat, cold, air pressure, purity and humidity, light, sound, vibration, and radiation may have to be faced. All these physical influences call for some adjustment or adaptation on the part of the human mechanism, even at rest, and still more so during the routine performance of that productive labour by which the operative earns his daily bread.

A great deal of reliable evidence relating to the effects of the working environment on the health and fitness of the workers in industry is available in the reports of the Industrial Health Research Board and of its forerunners the Industrial Fatigue Research Board and the Health of Munitions Workers' Committee, and it is well worth while to remind ourselves of some of the facts established by the laborious investigations on which those reports

were based. In many of the special enquiries carried out in the years immediately following the war, records of the output of workers were carefully collected over long periods and corrected for influences other than the environmental factors under investigation. In a report summarising the results of investigations in the textile, metal, boot and shoe, pottery, glass and laundry industries, published by the Industrial Fatigue Research Board in 1924,[2] it was pointed out that, with due safeguards, "output" is probably the most reliable index of fitness on the part of the worker, and that if an investigation shows that the influence of certain conditions on the workers is such that their output is reduced owing to causes which can be remedied, the employer and the operative have a common interest in bringing about the necessary improvement.

Ventilation, Temperature and Humidity

Although the term "ventilation" does, in its strictest sense, imply the actual air change or entry of fresh air into a factory, it is not possible to dissociate problems of ventilation from those of air temperature, humidity and air movement, for all these physical characteristics of the working environment influence body heat loss and thermal comfort. The over-all effect of the physical environment on the worker depends very largely upon the nature of his labour, for, in heavy muscular work, body heat may be produced and must be got rid of at four or five times the rate which permits heat balance in the case of a man performing light sedentary work.

Thus it is apparent that because of physiological considerations it is not rational or practicable to define one set of conditions of air temperature, humidity or air movement as a standard suitable for all types of industrial work.

It is an accepted fact that good ventilation is desirable on grounds of health and comfort, but it may be of value to indicate some of the evidence in regard to output, accidents and sickness in industry which constitute scientific proof of the particular significance of ventilation, temperature and humidity to the health and fitness of the workers. In one of his investigations on behalf of the Industrial Fatigue Research Board, Vernon[3] collected and compared the output data of workers in a number of tin plate factories and showed that in works where the ventilation was good, output remained practically steady throughout the year even during the hot months. In badly ventilated factories, however, the output of the men decreased on an average by 13 per cent. during the summer months, and it was estimated that the decrease amounted to as much as 30 per cent. during the hottest days as compared with the output achieved by the men during the coldest weather. Curves of output and external temperature during each month of the year were drawn, and these curves showed that in factories where the need for ventilation had not been met, the output of the men varied almost inversely with the temperature. (Fig. 1.)

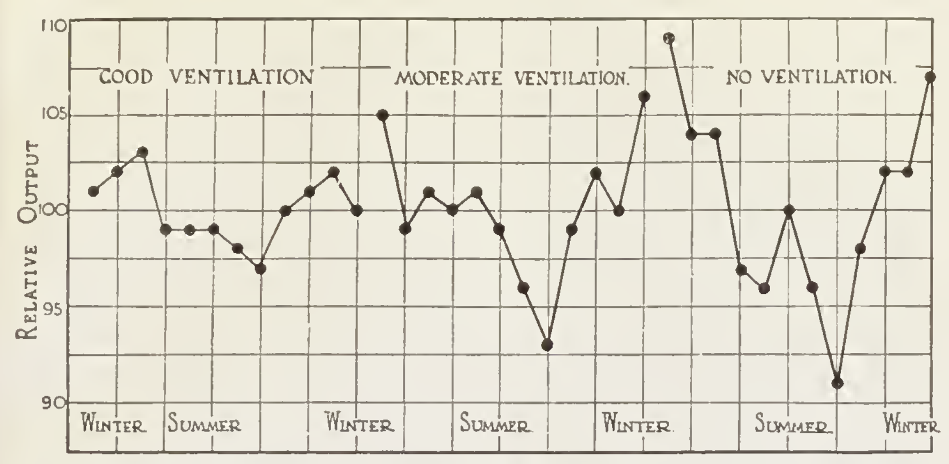


Fig. 1—Seasonal relationship between Ventilation and Output in tinplate factories (after Vernon)

During hot weather, ventilation is all the more important in view of the higher temperature of the air and the increased need for air circulation to help the body get rid of the heat produced by muscular effort. The greater the effort, the greater the need for ventilation, for muscular work is performed not at 100 per cent. efficiency but at best, at from 25 to 20 per cent., which means that four or five times as much energy in the form of heat must be got rid of by the body as is represented by the mechanical productive work done.

In a report on fatigue and efficiency in the iron and steel industry, published by the Industrial Fatigue Research Board in 1920,[4] a detailed analysis of the sickness records of over 20,000 workers was published and it was shown that men engaged in certain types of hot and heavy work are liable to suffer excessively from rheumatism and respiratory diseases in comparison with the average rate for all workers. Thus, according to the number of days of sickness per year the steel melters, teemers and pitmen showed an increase of 44 per cent. for rheumatism, 10 per cent. for respiratory diseases and 23 per cent. excess for all causes, as compared with the average for all workers combined. In the case of the puddlers, the excess percentages of sickness were 78 per cent. for rheumatism, 35 per cent. for respiratory diseases, and 20 per cent. for all causes. In the face of intense radiant heat encountered in such work, the men may sweat profusely though the air may be cold, and it is pointed out in that report that under such circumstances they incur great risks of chills.

In studies of output among miners where the men would, if they could, get as much coal as possible, further evidence was obtained as to the physiological significance of temperature and ventilation.[5] Thus, in a mine gallery where the temperature was 73.5°F. and the air velocity 87 feet per minute, the men took eight minutes to fill a tub with coal and rested 7.3 minutes every hour, this rate of out-

put being taken as the standard for comparison. In another mine gallery, where the temperature was 86.2°F. and the air velocity 10 feet per minute, the men took 9.6 minutes to fill the tubs and rested 22.4 minutes every hour. This rate of output worked out to be only 59 per cent. of the former. Out of sheer physiological necessity to cool off, the men rested for more than one-third of their shift time, and if they had not done so they would undoubtedly have suffered from heat collapse or heat stroke.

Although the worker in hot surroundings may succeed in maintaining his body temperature within normal limits by profuse sweating, he runs the risk of suffering from heat cramps due to the excessive loss of sodium chloride in the sweat. To prevent this condition from developing it is necessary for the worker to replace the sodium chloride as well as the water lost in the sweat and either take additional salt in his diet or drink water containing about one-sixth of an ounce of common salt to the gallon. If the water has a temperature of about 46-50°F. the taste of the salt will not be noticeable.[6] In some hot industries the employees are supplied with small flavoured tablets of salt which readily dissolve in water and make a palatable drink. Increased drinking of milk serves the same purpose owing to its salt content and, moreover, owing to its nutritional value it cannot fail to improve the diet.

Apart from the evidence based on output, the severity and frequency of accidents is also a useful index of excessive fatigue and impairment of fitness due to the working environment, and in the coal mines above referred to, increased accident frequency and accident severity were recorded in the hotter and more humid workings as compared with the rates in the relatively cool mines. As coal and precious metals have to be won at greater and greater depths, so too will the strain of the working environment on the miners increase. Although careful selection by heat tolerance tests and graded acclimatisation of workers, as in the mines on the Rand,[7] may, to a certain extent, lessen the risk of heat collapse, sooner or later man will have to control the physical environment of work in accordance with inescapable physiological requirements.

Medical scientists can help in prescribing physiologically desirable conditions, but not in designing and providing the mechanical means of controlling the working environment which modern engineering practice could readily achieve. It would cost money, but so does impaired fitness, accident, disease and death.

So far I have only referred to the effects of excessively hot and humid conditions, but we must not forget that in certain types of work involving little expenditure of energy and body heat production, the worker may not only experience discomfort and be seriously handicapped in performance, but be more liable to accidents if the working environment is unduly cool or cold. In this case it is not because the general body temperature falls, but because local

chilling of the hands decreases manual dexterity. (We all know how fumble-fingered we are if our hands are cold.) Vernon and Bedford[8] showed by carefully controlled tests involving the assembly of bicycle chains that if the hands become chilled to a temperature of 70°F. then there is a falling off of 12 per cent. in dexterity. This finding is of particular interest when considered in connection with the data of minor accident frequency in munition factories as recorded by Osborne and Vernon in 1922.[9] The effects of cold surroundings are aggravated if the materials handled are good conductors of heat, such as metal parts, and among men and women workers engaged in the manufacture of shells and fuses, it was found that minor accidents, such as cuts, increased if the temperature of the factory fell below the range of 65-69°F. The minor accident frequency was found to be increased by 37 per cent. in the case of the men and 34 per cent. for the women, when the workshop had a temperature of 50-54°F. as compared with 65-69°F., and the investigation also showed that minor accidents increased if the air temperature rose much above 70°F.

Although these facts were established by investigations carried out for the Health of Munitions Workers' Committee and the Industrial Fatigue Research Board nearly twenty years ago, they have an added significance to-day in the light of the recent findings recorded by Bedford[10, 11] in the report of the Industrial Health Research Board on the warmth factor in comfort at work. Bedford carried out a very intensive survey of the environmental conditions in a number of factories and correlated the physical characteristics of the environment with the comfort sensations of several thousand workers engaged in sedentary work. He found that during the winter months 70 per cent. of the workers felt quite comfortable when the air temperature was within the range 60-68°F. and no less than 86 per cent. described themselves as being either comfortably warm, comfortable or comfortably cool. Of course, some people, owing to individual sensitivity or unsuitable clothing or diet, feel too warm or too cold in almost any ordinary environment, but the fact established by this investigation that within this range of temperature 60-68°F., when the air movement is of the order of 20 to 50 feet per minute, 86 per cent. of sedentary workers experience thermal comfort at work in winter time, provides industry with data on which to take necessary action with a view to ensuring optimum conditions for this type of industrial work. It may well be that the comfortable worker can be the careful worker and that the distraction of discomfort is a more potent cause of accidents than we yet realise.

Radiant Heat

In the glass industry, as well as in the manufacture of iron and steel to which I have already referred, intense radiant heat has of necessity to be faced by certain workers. Increased ventilation and

blasts of cool air can only partially compensate for the heat gain on the exposed areas of the bodies of these workers who sweat profusely in spite of such measures. Under such circumstances the worker needs special protection for his body as well as for his eyes. In the case of his eyes he is usually provided with tinted glass shields, but I feel convinced that both body and vision could be efficiently protected against the most intense radiant heat encountered in industry by the use of metallic foil-faced asbestos aprons and gloves and face masks fitted with eye-pieces of tinted heat-absorbing glass. A few weeks ago I had an opportunity of testing such protective clothing at a glass works, where there was a huge kiln containing molten glass at a temperature of 1600°Centigrade, and I found I could stand for several minutes about 3 feet away from the open door of the furnace without being aware of the intense radiant heat. The men operating the furnace did so from a distance of 10 to 12 feet and obviously felt the heat acutely. (Fig. 2.)



Fig. 2—Furnace worker wearing heat-reflecting protective clothing.

The high heat-reflecting properties of metallic foil have also been made use of in radiant heat screens for laundry workers. By making use of such protective devices the worker will be able to control the radiant heat factor in the working environment and still do his work, but with less fatigue and risk. Considerable discomfort may be felt by workers in buildings and hutments of light construction due to excessive loss or gain of radiant heat owing to the surface temperature of ceilings and walls in winter or summer, but this can readily be overcome by making use of the properties of metallic surfaces for heat insulating purposes.[12]

Vibration and Noise

In certain occupations, such as shipbuilding, boiler making, steel construction, road breaking and the manufacture of boots and shoes, vibration and noise characterise the working environment. Excessive continuous vibration of the body as a whole is very fatiguing and fortunately this is rarely met with, but the use of pneumatic riveting hammers and other tools, the effective action of which depends on manual control by the worker, may affect the circulation in his hands and fingers. Experimental investigation has shown that low air temperature and excessive air movement near the workers' hands aggravate the local chilling effect due to the use of vibrating tools. In the boot and shoe industry, local warming by radiators directed on to the hands of the worker as he holds the sole against the pounding up machine would, I think, prove of benefit. In riveting in ship construction and in boiler-making the compressed air which enters the tool near the handle could be artificially warmed if the air pipe passed through a local heater. This would prevent excessive chilling of the handle when the compressed air expands as it works the tool and might also prevent the freezing up of such tools on cold mornings. Many workers in these trades complain of "dead hand" or "dead fingers," and there is evidence that they become very sensitive to cold as a result of such work. I think this handicap could be largely, if not entirely, overcome if attention were paid to local warming on the lines indicated, and I should very much like to see these suggestions tried out during winter months in this country.

In regard to noise, which is almost always associated with vibrating and rapidly operating machinery, gradual and permanent impairment of hearing may result if it is very intense as in boiler-making and riveting in ship construction. If some of the effective ear stops which are available were systematically used by the workers, I have little doubt but that the traditional handicap of "boiler makers' deafness" would cease to exist. Very effective ear stops of cotton wool and wax have been devised by Luxton and

these have proved of great benefit to workers in a number of noisy trades.[13] In this connection I must mention a most unexpected set-back to the use of these protective devices which occurred recently. The workers engaged on a particularly noisy task in a large factory in the North of England had been provided with the ear stops which they used regularly and with undoubted benefit for a year or so. Then a group of fellow workers, not engaged on the particular job, laughed at them for wearing the stops in their ears and this led to the discontinuance of their use. There is little doubt but that preventable deafness will now become inevitable in these men as a result of the thoughtless action of their fellows. (Figs. 3 and 3a.)



Fig. 3—The Luxton Ear Stop of Cotton Wool and Wax.



Fig. 3a—Inserting the Luxton Ear Stop in position.

In regard to the reduction of general noise in factories a good deal can be done by using absorbent panels on walls and ceilings and this no doubt lessens fatigue. Where such measures are not possible, then the use of ear stops or ear defenders is advantageous to the workers, as shown by Weston and Adams,[14] who found that the use of these devices by weavers increased their personal efficiency by 7½ per cent.

Illumination

In almost every type of industrial work the special sense of vision is called upon to function more or less acutely and continuously, hence the provision of physiologically adequate natural and artificial lighting in factories is essential not only to prevent eye strain and render it possible for the task to be performed with maximum efficiency, but to give the worker a fair opportunity of avoiding accidents due to falling or contact with machinery or obstacles in gangways, stairs or passages. Vernon[15] has recently collected together in a readily accessible form reliable data in regard to the significance of adequate lighting to the incidence of accidents. He draws particular attention to the fact that on an average, in industry generally, 25 per cent. more accidents occur during the hours of artificial lighting than during daylight. In the docks the increase amounted to 51 per cent. and in the textile industry to 46 per cent. for all accidents. Even more striking are the percentages given for the increase in accidents in artificial light due to falling, namely, in the docks 102 per cent., textile industry 76 per cent., engineering 93 per cent., shipbuilding 99 per cent., and founding metals 99 per cent.

It has been shown in standard tests for eyesight that the visual acuity of the normal eye increases very markedly as the intensity of illumination is raised from 2 to 20 foot candles and improves still further up to 100 foot candles. It is not surprising therefore that if passages, stairs and yards have a ground illumination of less than 2 foot candles, as is very often the case, the risk of falling over obstacles is unnecessarily great. I think too little attention has been drawn to the fact that by using ceiling and wall finishes of light colour having high light reflectivity characteristics a two- or three-fold increase in intensity of illumination on the working plane and in passages can be readily obtained without any increase in the candlepower of the source. For example, a grey finish to a wall might reflect only 10-20 per cent. of the light from an electric bulb, but a pale cream finish would reflect 76 per cent. and golden yellow 80 per cent. To finish the walls and ceilings of stairs and passages in such colours would cost very little and immediately increase the effectiveness of artificial lights already installed, and as a direct result lessen the risk of accidents. It must be remembered also that glare from the light source may seriously impair vision and that therefore great care is necessary in determining the arrangement and shading of artificial lighting units.

Turning to data on output for further evidence of the importance of adequate lighting in the working environment, it is worth while to recall that interesting and valuable investigation carried out by Weston and Taylor[16] on the relation betwen illumination and efficiency in typesetting by hand, a report of which was published in

1926 by the Industrial Fatigue Research Board and the Illumination Research Committee of the Department of Scientific and Industrial Research. In that investigation a series of tests with skilled compositors as subjects was carried out, and it was found to be necessary to increase the intensity of artificial illumination to at least 24 foot candles in order for the efficiency of typesetting to approach that attained in good daylight lighting. Efficiency was judged on the basis of the number of errors, turned letters and total output, and an examination of the data revealed the fact that if the illumination was only 2 foot candles, output decreased by 25 per cent., mistakes more than doubled and the fatigue felt by the compositor materially increased. On behalf of the Industrial Fatigue Research Board, Weston and Adams investigated the effect of eyestrain on the output of linkers in the hosiery industry,[17] and the relief of eyestrain among persons performing very fine work as in the mounting of lamp filaments.[18] Those investigations showed that workers with normal or defective eyesight could be materially helped in performance and in the relief of eyestrain by the use of suitable spectacles specially prescribed to assist them in focussing fine objects and relieve the strain in converging their eyes.

Dust and Fumes

In the time and space at my disposal it is not possible for me to deal with the problems of harmful dusts and fumes which constitute special hazards to health and fitness in certain industries. I would point out, however, that the lungs are adapted to deal with pure air, and this being the case every effort should be made to maintain its purity in the working environment, irrespective of whether the fumes or dust are known to be toxic. I have seen effective measures against dust and fumes taken in the most dangerous of industries and know that the engineer, in co-operation with the medical scientist, can provide the necessary means of controlling the working environment in this respect.

Conclusion

In this lecture I have attempted to deal with those physical characteristics of the working environment which if left uncontrolled may readily cause discomfort and by imposing too great a strain on the physiological powers of the human body, predispose to ill-health and unfitness, increased liability to accidents and decreased capacity for work. In many modern factories the workers have ideal conditions for their labour because attention has been paid to these matters. I have, however, tried to indicate the steps which need to be taken throughout industry generally before we can justly claim that in this country the workers have full physiological opportunity for their labour. I feel convinced that in this time of progress

there is a field of endeavour before the Industrial Welfare Society and other bodies working along similar lines which will more than repay any efforts we may make to improve the working environment in the interests of the worker, of industry, and the nation.

REFERENCES

[1] *Crowden, G. P.*, "Muscular Work, Fatigue and Recovery." Pitman. London. 1932.

[2] Report No. 27. Industrial Fatigue Research Board. H.M. Stationery Office, 1924.

[3] *Vernon, H. M.*, "The Influence of Hours of Work and of Ventilation on Output in Tinplate Manufacture." Report No. 1, Industrial Fatigue Research Board. H.M.S.O. 1919.

[4] Report No. 5. Industrial Fatigue Research Board. H.M.S.O. 1920.

[5] *Vernon, H. M., and Bedford, T. (assisted by Warner, C. G.)*, "The Relation of Atmospheric Conditions to the Working Capacity and Accident Rate of Coal Miners." Industrial Fatigue Research Board Report No. 39. H.M.S.O. 1927.

[6] *Dill, D. B., Bock, A. V., Edwards, H. T., and Kennedy, P. H.*, "Industrial Fatigue." J. Industrial Hygiene and Toxicology, vol. XVIII., No. 7, 1936.

[7] *Dreosti, A. O.*, "Problems arising out of Temperature and Humidity in Deep Mining on the Witwatersrand." J. Chemical, Metallurgical and Mining Society of South Africa, November, 1935.

[8] *Vernon, H. M., and Bedford, T. (assisted by Warner, C. G.)*, "A Study of Heating and Ventilation in Schools." Industrial Health Research Board Report No. 58. H.M.S.O. 1930.

[9] *Osborne, Ethel E., and Vernon, H. M.* "The Influence of Temperature and Other Conditions on the Frequency of Industrial Accidents." Industrial Fatigue Research Board Report No. 19. H.M.S.O. 1936.

[10] *Bedford, T.*, "The Warmth Factor in Comfort at Work." Industrial Health Research Board Report No. 76. H.M.S.O. 1936.

[11] *Bedford, T.*, "Modern Principles of Ventilation and Heating." H. K. Lewis. 1937.

[12] *Crowden, G. P.*, "Insulation against Heat and Cold for Human Comfort." *The Lancet*, 6th January, 1934.

[13] *Crowden, G. P.*, "Defective Hearing as a National Problem." *British Medical Journal*, 25th August, 1934.

[14] *Weston, H. C., and Adams, S.*, "The Performance of Weavers under Varying Conditions of Noise." Industrial Health Research Board Report No. 70. H.M.S.O. 1935.

[15] *Vernon, H. M.*, "Accidents and their Prevention." Cambridge University Press. 1936.

[16] *Weston, H. C., and Taylor, A. K.*, "The Relation between Illumination and Efficiency in Fine Work (Typesetting by Hand)." H.M.S.O. 1926.

[17] *Weston, H. C., and Adams, S.*, "The Effect of Eyestrain on the Output of Linkers in the Hosiery Industry." Industrial Fatigue Research Board Report No. 40. H.M.S.O. 1927.

[18] *Weston, H. C., and Adams, S.*, "On the Relief of Eyestrain among Persons performing Very Fine Work." Industrial Fatigue Research Board Report No. 49. H.M.S.O. 1928.

DISCUSSION

Dr. Crowden, in reply to various questions, stated that they had found that with the ear stops, the men were able to talk to each other while riveting was going on, whereas this had not been possible before.

Mr. A. W. Inglis (*Imperial Chemical Industries, Ltd.*) said that his company had tried to introduce the Luxton ear stops in a number of works, but apart from the ridicule which resulted, there were two difficulties. The men working in fairly hot atmospheres complained of ear ache when they took them out, and also men working in certain departments were unable to hear warning signs for danger, whereas they could hear them without the ear plugs.

Dr. Crowden said that ear plugs were for use where the noise was very intense. As ear ache usually arose from inflammation in the middle ear, i.e., behind the ear drum, it was very unlikely that it would be caused by the insertion of the cotton wool of the plugs into the outer ear.

Mr. B. L. Lelliott (*Associated Portland Cement Mfrs., Ltd.*) was glad to learn of the protective measures being taken by the School, but thought the more that could be done to attach the protective device to the machine rather than to the person, the better. Respirators, for example, were not worn consistently, and there was also the factor of discomfort and the need for replacements. The dust question could be tackled by a dust plant over the machine, enabling the men to work in comfort.

Dr. Crowden did not agree entirely with Mr. Lelliott. In some cases it was possible to make protection automatic, as by the dust extraction plant, but this was not possible where, in order to do their work efficiently, the men had to stand as near as possible to

a hot furnace. Unless the process was modified, it appeared that in some cases the environmental hazard could not be countered except by individual protection.

Miss C. J. Mann (College of Nursing) asked if experiments had been made in the pure silk hose linking rooms, and if there was an agreed working temperature. A high temperature was required for working with silk, and it seemed to vary with different firms.

Dr. Crowden suggested the fixing of a powerful jet fan to increase air movement. This would not modify the heat and humidity necessary for the particular process, but would make for physiological comfort. (Fig. 4.)

Miss G. Burlton (*Burlton Institute*) asked if mental energy was as sensitive to conditions as muscular energy, and if people really became acclimatised. For example, noise, even when not bad enough to deafen one, might do sub-conscious harm.

Dr. Crowden said that in reply to the first question, conditions were bound to have some effect, but to measure it would be practically impossible. One could develop a kind of inertia against disturbance. He did not know, however, of any reliable data on the expenditure of mental energy. In an investigation into typewriting, Dr. May Smith found that the supervision of workers was more important than the use of noisy or noiseless typewriters.

Mr. A. F. Stewart (*Venesta, Ltd.*) asked if aluminium foil was the best.

Dr. Crowden said that any metal with a reflecting surface which did not tarnish or oxidise would do. Gold and platinum were no doubt better, but aluminium foil certainly had durability and retained its surface brightness.

Mr. J. B. Longmuir (*Mavor and Coulson, Ltd.*), in proposing a vote of thanks to the speaker, said that the question of sickness was one of the most important questions in industry. Mechanisation must contribute a great deal to the worker's health. The miner did not have to undertake such heavy physical work with the introduction of the conveyor and the mechanical loader, and this must make ventilation easier. Illumination and the colour of walls were equally important, and windows and walls must be kept clean. Every new development brought more problems to solve. As an example, they were hopeful that electric welding was going to reduce the evil effects of riveting, and now they were afraid of the

fumes from electric welding. Wherever possible they did the welding in cubicles, with a fan working, or else they put a little jet of air inside the man's helmet.



Fig. 4—The Angus Portable Jet Fan for dispersing fumes.



MINISTÈRE DU COMMERCE.

COMITÉ CONSULTATIF D'HYGIÈNE PUBLIQUE DE FRANCE.

RAPPORT

ET

PROJETS DE LOI ET RÈGLEMENTS

RELATIFS

À LA SALUBRITÉ ET À LA SÉCURITÉ DU TRAVAIL,

PRÉSENTÉS

PAR UNE COMMISSION

COMPOSÉE

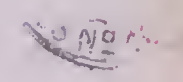
DE MM. BROUARDEL, C. NICOLAS, DUBRISAY,
PAUL DUPRÉ, FAURE-DUJARRIC, PAUL GIRARD, GRIMAUX, JACQUOT
ET NAPIAS, *rapporteur*.



PARIS.

IMPRIMERIE NATIONALE.

M DCCC LXXXV.



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et Napias, *rapporteur*.

Par une lettre en date du 5 mars 1884, M. le Ministre du commerce a demandé au Comité consultatif d'hygiène de préparer un projet de loi relatif à l'hygiène des manufactures, usines, mines, chantiers et ateliers.

Les termes de la lettre ministérielle nous avaient d'abord fait supposer qu'il s'agissait de préparer une loi complète d'hygiène industrielle, s'attachant à réglementer autant les conditions de la salubrité extérieure que celles de la salubrité intérieure, s'occupant enfin des questions d'hygiène soulevées par la durée du travail suivant les âges et suivant les sexes.

Mais il résulte des explications précises de M. le Directeur du commerce intérieur que le Comité est seulement consulté sur les questions d'hygiène intérieure, c'est-à-dire sur les conditions de salubrité et de sécurité nécessaires à l'ouvrier dans les manufactures, mines, chantiers, ateliers, etc. C'est dans ces limites que la troisième commission s'est renfermée en étu-

diant et proposant les articles du projet de loi et des règlements d'administration publique annexés à ce rapport. La troisième commission a pensé d'ailleurs que, si elle devait borner là ses propositions de réglementation, elle pouvait en même temps, dans son rapport, jeter un coup d'œil d'ensemble sur quelques autres points d'hygiène industrielle qui sont étroitement liés à l'hygiène de l'ouvrier dans l'atelier.

Ce rapport se trouve ainsi divisé en trois parties :

Dans la première, on a fait le tableau de la législation en matière d'hygiène industrielle à l'étranger et en France;

Dans la seconde partie, on s'est attaché à fournir les raisons justificatives du projet de loi et des projets de règlements proposés par la commission, puis on a indiqué les vues de cette commission relativement au recrutement des inspecteurs;

Enfin, dans la troisième partie, la commission a dit son avis sur les questions d'hygiène industrielle relatives à l'âge et au sexe des travailleurs, ainsi qu'à la durée du travail journalier.

I.

La nécessité de l'intervention de la loi dans les questions d'hygiène industrielle n'est plus à démontrer. L'autorité n'a pas seulement le droit, elle a le devoir d'intervenir pour la protection de la santé et de la vie, et de restreindre en de certaines limites la liberté individuelle quand l'abus qu'on en peut faire devient attentatoire à la liberté et à la santé de la communauté.

Or les opérations industrielles comportent toujours des dangers graves pour la santé et pour la vie. L'attitude du corps pendant le travail, la disposition défectueuse, le cubage restreint des locaux, l'aération et la ventilation insuffisantes des ateliers, l'atmosphère qu'on y respire, les matériaux qu'on y met en œuvre, rendent encore vraie aujourd'hui cette phrase de Ramazzini dans la préface de son livre sur les maladies des artisans : « Il faut convenir que les métiers deviennent une source de maux pour ceux « qui les exerçent, et que les malheureux artisans, trouvant les « maladies les plus graves là où ils espéraient puiser le soutien de « leur vie et celle de leur famille, meurent en maudissant leur in« grate profession. » Dans un style plus sobre et plus précis, M. de Freycinet a dit : « La plupart des industries, on pourrait dire « toutes les industries, sont insalubres. »

Et si certaines usines et manufactures sont actuellement installées dans des conditions de salubrité voisines de la perfection, c'est encore le très petit nombre, c'est l'exception; et l'on ne saurait trouver là un prétexte pour s'opposer à une réglementation légale.

Sans doute la substitution de la machine à la main de l'homme dans beaucoup d'industries a contribué à l'assainissement. Tous les hygiénistes l'ont observé depuis Benoiton de Châteauneuf et Villermé; mais c'est dans une mesure qui n'est pas égale et qui est toujours insuffisante. D'ailleurs, les conditions du travail mécanique ont créé des dangers nouveaux; ce que la salubrité du travail a souvent gagné à l'emploi des machines a été en partie perdu par l'insécurité qui résulte des mécanismes; et cela d'autant plus que, si au temps où le travail était exclusivement manuel l'industrie n'attachait de prix qu'à la force, l'emploi des machines a permis d'introduire dans l'atelier, les faibles, les femmes, les enfants; et que ces derniers surtout se trouvent exposés à cause de l'imprudence et de l'étourderie de leur âge.

La nécessité s'impose de réglementer les conditions de sécurité en même temps que les conditions de salubrité du travail industriel. «Quand il s'agit des forces vives de la nation, disait un jour «à la Chambre M. le député Richard Waddington, c'est pour «le législateur non seulement un droit, mais un devoir d'inter-«venir *et de prendre, aux dépens, s'il le faut, d'intérêts particuliers, les «dispositions exigées par l'intérêt général* [1].»

Ce n'est pas seulement une question d'humanité qui doit guider l'autorité dans cette voie, c'est aussi une question d'intérêt bien entendu; la vie humaine est une grosse valeur qui doit compter pour quelque chose dans la richesse d'un pays, et dont il est sage de se montrer économe. Ajoutons que les conditions hygiéniques ont une part à réclamer dans les questions de morale; les Anglais l'avaient ainsi compris quand, en 1802, Sir Robert Peel fit accepter la première loi relative à l'hygiène industrielle et qu'on l'appela : Loi de morale et de santé (Moral and Health Act); et que ce n'est pas sans raison que, chez nous, Cadet-Gassicourt

[1] Déjà en 1848, répondant à une demande de M. le Ministre du commerce, la Chambre de commerce de Rouen disait que «le travail dans les manufactures doit être sagement réglementé dans l'intérêt de l'humanité, que protection est due à l'ouvrier contre les abus de la liberté illimitée et que l'abaissement de la valeur des produits ne doit jamais être obtenu aux dépens de la santé des travailleurs». Elle ajoutait aussi : «Il est du devoir d'un gouvernement vraiment populaire de mettre d'invincibles obstacles à cet immoral mode de concurrence.»

concluait, il y a un demi siècle, d'après un travail statistique présenté par lui à la Société d'émulation, que « la moralité des artisans est ordinairement en raison de l'instruction que chaque état suppose, du bénéfice qu'il donne, et de la salubrité des manipulations ».

Ces trois termes des conditions morales de la classe ouvrière : *instruction, salaire, hygiène professionnelle,* sont également dignes de fixer l'attention de l'Etat.

Déjà des sacrifices considérables ont été faits par la République pour répandre l'instruction; et la loi a rendu obligatoire l'instruction primaire. La liberté permet à l'ouvrier de régler lui-même les questions relatives au salaire. Seules les conditions de l'hygiène du travail ont insuffisamment attiré jusqu'ici l'attention du législateur.

Pourtant quelques efforts ont été faits; mais, avant de les rappeler, exposons sommairement les dispositions prises dans les différents pays pour assurer la salubrité et la sécurité du travail.

Angleterre. — On peut dire que c'est en Angleterre que les conditions d'hygiène industrielle ont été le plus réglementées. Depuis le *Moral and Health Act* de 1802, qui porte communément le nom de *Sir Robert Peel's Act,* jusqu'au *Factory Act* de 1878, une quantité vraiment considérable de lois ont été tour à tour édictées et abrogées; — lois de détail dont les prescriptions visaient souvent une seule industrie : fabriques de dentelles, mines, filatures de coton, imprimeries, boulangeries, fabriques d'alcali, etc.; lois parcellaires qu'on a de temps à autre tenté de réunir en une loi générale sur l'industrie, un *Factory Act*[1], et qui sont à présent

[1] Voici les principaux *Acts* anglais relatifs à l'industrie depuis 1802 :

1802. Moral and Health Act. (Sir Robert Peel's Act.)
1819. Cotton Mill's Act.
1825. Sir John Hobhouse's Act.
1831. Factory Act of 1831.
1833. Factory Act of 1833.
1842. Mining Act.
1844. Factory Act of 1844.
1845. Print Works Act.
1847. Ten Hours Act.
1853. Act regulating the children working day.
1854. Smoke Nuisance Abatement Act.
1855. Nuisance Removal Act.
1860. Bleachworks Act.
1860. Coal and Iron Mines Act.
1861. Lace Manufactories Act.
1862. Petroleum Act.
1863. Bakehouse Act.
1864. Alcali Act.
1867. Factory Extension Act.
1867. Workshops Regulation Act.
1867. Factory and Workshops Act.
1871. Factory and Workshops Act.
1871. Petroleum Act.
1872. Coal Mines Regulation Act.
1873. Agriculture Children Act.
1874. Alkali nuisances Prevention Act.
1878. Factory and Workshops Act.

sans compter les dispositions applicables à l'assainissement des ateliers qui peuvent se

abrogées ou rendues inutiles pour la plupart par les dispositions du *Factory and Workshops Act* de 1878.

Le *Factory and Workshops Act* de 1878 s'occupe, à la fois, de la salubrité, de la sécurité, du travail des enfants et des femmes. On a compris en Angleterre que ces questions sont étroitement unies et qu'elles doivent être soumises au contrôle d'un seul service d'inspection compétent en matière de salubrité.

Autriche-Hongrie. — L'Autriche avait jusqu'à ces derniers temps une loi sur les métiers (1872), une loi sur le travail des enfants (1869). De plus la loi d'hygiène publique de 1876 armait l'autorité par son article 15 pour tous les cas ne tombant pas sous le coup de la loi des métiers de 1872[1]. Enfin un certain nombre de lois partielles sur les machines (1870), sur la fabrication des allumettes (1869), sur le nitrobenzol (1874), sur le traitement des ouvriers malades (1879), etc., complétaient la législation en matière d'hygiène industrielle.

Depuis le 15 mars 1883 il existe en Autriche une loi organique sur l'industrie, qui a modifié la loi du 20 décembre 1859; et depuis le 17 juin 1883, une autre loi a créé un service d'inspection chargé de la faire exécuter, c'est-à-dire de veiller : 1° à la protection de la vie et de la santé des ouvriers, 2° à la durée journalière et aux interruptions périodiques du travail; 3° de s'occuper de l'exécution des règlements, des salaires, de l'emploi des travailleurs; 4° de l'éducation industrielle des apprentis[2].

Allemagne. — En Allemagne les questions d'hygiène industrielle sont réglées par la loi de 1869 sur les métiers, modifiée par la loi du 17 juillet 1878. Cette loi s'occupe à la fois de la salubrité extérieure et des conditions de la création et de l'installation

trouver dans le *Public Health Act* de 1875 (articles 112, 113, 114, 115) et sans parler d'une foule de réglementations visant les tailleurs, les cordonniers et les fabriques de gants et de chapeaux; les fabriques de machines, les verreries, les papeteries, etc., lois partielles fondues de temps à autre dans une loi générale, et actuellement dans le *Factory Act* de 1878.

[1] *Loi du 3 avril 1876, art. 15.* — L'autorité veille à ce que les entreprises industrielles n'exercent aucune action fâcheuse sur la santé publique.

Elle fait en outre des prescriptions pour supprimer et empêcher les influences nuisibles et dangereuses pour la santé publique provenant des industries et des professions qui ne tombent pas sous le coup de la loi sur les métiers de 1872.

[2] La loi de 1859, amendée par la loi du 15 mars 1883, s'occupe des rapports entre le patron et l'ouvrier, de l'organisation des assurances, des caisses de secours, du travail des enfants, etc. Nous aurons à en citer divers extraits et nous aurons à donner plus loin exactement le texte de la loi du 17 juin 1883.

des établissements industriels, de la salubrité intérieure [1]; du travail des enfants; et, comme cette loi est applicable à tout l'Empire, les anciennes lois sur le travail des enfants antérieurement appliquées en Bavière, à Bade, en Saxe, sont à présent abrogées.

Belgique. — En Belgique, l'arrêté du 29 janvier 1863 s'occupe surtout de la salubrité extérieure, des conditions d'installation et de la division en trois classes des industries réputées insalubres ou incommodes. C'est une reproduction presque complète de notre décret du 15 octobre 1810. Toutefois une disposition s'y trouve introduite, qui vise la salubrité intérieure et les mesures d'hygiène concernant les ouvriers [2]. La Belgique n'a pas réglementé le travail des enfants; seul le travail des enfants dans les mines se trouve réglé par l'article 29 du décret du 3 janvier 1813, qui a eu longtemps force de loi en France et qui fixe à 10 ans le minimum d'âge d'admission au travail souterrain.

Danemark. — Une loi du 10 mars 1852 s'occupe surtout de la salubrité extérieure, des conditions d'emplacement des manufactures et ateliers insalubres. Il ne semble pas que le législateur ait songé à la salubrité intérieure; il est possible que l'autorité ne soit pas complètement désarmée cependant, grâce à une disposition de l'article 5 qui dit que *les industriels seront en outre tenus absolument de se soumettre aux prescriptions que la police de santé jugera nécessaires.*

Le Danemark a une loi spéciale sur le travail des enfants (Loi du 23 mai 1873); elle comprend un certain nombre de prescriptions relatives à la salubrité et à la sécurité, mais elle ne s'applique qu'aux ateliers où l'on emploie les enfants.

[1] *Loi du 17 juillet 1878, art. 16.* — Pour la création d'établissements qui, par leur situation locale ou par des ateliers, fabriques, etc., peuvent amener, pour les propriétaires ou habitants des terres voisines ou pour le public en général, des préjudices, des dangers ou des incommodités, il faut en demander l'autorisation aux autorités compétentes en vertu des lois régionales.....

Art. 18. L'autorité doit examiner si l'établissement peut amener pour le public de grands dangers, préjudices ou inconvénients. C'est après cet examen, qui s'étendra en même temps à l'observation des prescriptions en vigueur concernant la police des bâtiments, des feux et de la salubrité publique, que l'autorisation sera refusée ou accordée, après fixation des conditions jugées nécessaires. Au nombre de ces conditions sont les prescriptions nécessaires pour la protection des ouvriers contre les dangers qui menacent leur santé et leur vie.

[2] *Arrêté royal du 29 janvier 1863, art. 6.* — Les autorisations sont subordonnées aux réserves et conditions qui sont jugées nécessaires dans l'intérêt de la sûreté, de la salubrité et de la commodité publique, ainsi que dans l'intérêt des ouvriers attachés à l'établissement.

Espagne. — En Espagne, c'est dans la loi sur le travail des enfants (24 juillet 1873), que nous trouvons indiqué, incidemment, à l'article 9, que les établissements industriels insalubres ne doivent être construits qu'après autorisation et approbation des précautions indispensables d'hygiène et de sécurité pour les ouvriers [1].

Hollande. — En Hollande, il existe une loi sur le travail des enfants (19 septembre 1874), qui ne fait que fixer l'âge d'admission au travail industriel sans faire aucune prescription relative à la salubrité ni à la sécurité.

Italie. — En Italie, les prescriptions particulières de l'hygiène industrielle sont laissées à l'initiative des députations provinciales. Ces prescriptions visent surtout la salubrité intérieure [2].

Depuis le 21 juin 1880, le Ministre de l'agriculture et du commerce et le Ministre de l'intérieur ont proposé une loi sur le travail des enfants et des femmes, qui est restée à l'état de projet.

Portugal. — Une loi du 31 octobre 1863, qui est l'analogue de notre décret du 15 octobre 1810, vise seulement la salubrité extérieure, et ne fait pas mention de la salubrité extérieure ni de l'hygiène des ouvriers. Pourtant, nous voyons dans la loi portugaise du 3 décembre 1868 sur l'organisation générale de l'hygiène publique, que la junte sanitaire donne son avis *sur la police sanitaire des établissements industriels insalubres, incommodes et dangereux et sur l'hygiène des ouvriers qui y sont employés* [3].

Roumanie. — En Roumanie, nous ne trouvons, dans la loi sur l'organisation du service sanitaire (8 juin 1874), que des préoccupations relatives à la salubrité intérieure, qui se manifestent par une classification des établissements industriels comme dans notre loi de 1810 [4].

[1] Le projet de loi sur la santé publique déposé aux Cortès espagnols, le 20 mars 1882, par le Ministre de l'intérieur, et dont nous trouvons une traduction dans l'*Étude sur l'administration sanitaire civile à l'étranger et en France*, du Dr A.-J. Martin, se contente de dire :

Art. 116. *Les établissements d'industries insalubres devront être convenablement situés hors des lieux les plus habités, dans la partie exposée aux vents régnants et suffisamment isolés, toujours après avoir informé les juntes sanitaires des conditions d'emplacement et des autres circonstances.*

[2] Voir par exemple les articles 20, 21, 22 du Règlement sanitaire de Turin.

[3] *Voir A.-J. Martin, Loc. cit.*

[4] Art. 108. — Les établissements industriels sont rangés en trois classes : ceux de 1re classe peuvent s'installer dans l'intérieur des villes ou des communes; ceux de

Russie. — D'après une note communiquée à MM. les docteurs Gubler et Napias, pour leur rapport au Congrès d'hygiène de Paris en 1878, par M. le Comte de Suzor, architecte de la ville de Saint-Pétersbourg, voici quelle serait la situation en Russie.

Il n'y a point en Russie de règlements spéciaux indiquant les mesures à prendre pour prévenir, dans les usines et les fabriques, les mauvaises influences de l'air vicié et des exhalations malsaines sur la santé des ouvriers. Mais la législation russe, et principalement le code médical et le code des constructions, donnent à l'autorité locale (administration municipale ou gouvernementale, service médical, police, etc.) le droit d'exiger que la construction, l'installation et l'exploitation des fabriques, usines, etc. se fassent dans des conditions qui puissent entièrement satisfaire aux exigences de l'hygiène; ce qui équivaut, autant que possible, aux règlements spéciaux qui existent dans d'autres pays.

C'est dans le but indiqué ci-dessus que les mesures suivantes ont été prescrites :

1° Une commission officielle, composée de l'architecte ou de l'ingénieur de la ville ou de l'arrondissement, d'un médecin, d'un conseiller municipal, du commissaire de police ou d'un membre du conseil des manufactures, examineront l'emplacement sur lequel doit être élevée l'usine ou la fabrique. La commission dresse procès-verbal de son examen et consigne les mesures qu'elle trouve utiles ou nécessaires, tant pour prévenir les réclamations des habitants du voisinage que pour sauvegarder la santé des ouvriers.

2° Les plans détaillés de l'édifice à construire sont soumis à l'examen du comité technique, municipal ou gouvernemental (municipal dans les villes, gouvernemental dans les provinces).

C'est à ce comité qu'incombe, d'après le code des constructions, le droit et même l'obligation de faire subir à un projet soumis à son examen et à son approbation tous les changements qu'il trouve nécessaires, tant pour répondre aux exigences de la stabilité, de la solidité et de l'hygiène, que pour prévenir les dangers d'incendie, tout en se conformant aux besoins de la fabrication et de l'exploitation; de plus le comité porte une attention toute spéciale sur les moyens projetés pour la ventilation.

3° Après l'achèvement de la construction de l'usine ou de la

2° classe ne peuvent le faire qu'aux abords de ces agglomérations; ceux de 3° classe doivent rester à 1 kilomètre au moins des villes et à 1 demi-kilomètre des agglomérations des communes rurales.

fabrique, une commission spéciale, à l'instar de celle qui fait l'examen préliminaire de l'emplacement, doit se livrer à une inspection détaillée de l'édifice pour vérifier si la construction est en tous points conforme au projet approuvé, et si tous les aménagements pour une bonne ventilation ont été effectués; si les machines sont disposées de manière à éviter les accidents et sont isolées par des grillages ou garde-fous du côté du passage des ouvriers; cette commission dresse un procès-verbal de son examen, et est en droit d'exiger les améliorations qu'elle trouve encore utile d'appliquer. Ce procès-verbal est d'une grande importance, car il doit constater le bon ou le mauvais aménagement de l'usine ou de la fabrique, et fournit à l'autorité locale des motifs rationnels pour permettre l'exploitation ou pour la défendre.

L'autorité locale a, en outre, le droit d'exiger, dans les fabriques et usines déjà existantes, les installations et aménagements qui lui paraissent propres à améliorer les conditions d'hygiène et de salubrité publiques.

De plus, pour prévenir les accidents en cas d'incendie et pour faciliter la prompte évacuation des ateliers par les ouvriers, tout atelier dont la longueur dépasse 8 sagènes (15 mètres) doit avoir deux sorties ou deux escaliers incombustibles.

Dans le cas où il y a dans les usines ou fabriques des logements d'ouvriers, la commission fixe pour chaque cas, selon les conditions locales, les dimensions et le système de chauffage et de ventilation, le nombre maximum d'ouvriers qui doivent habiter une seule chambre.

En ce qui concerne le préjudice ou le dommage auquel le voisinage pourrait être exposé, toutes les usines et fabriques sont divisées en trois classes et éloignées plus ou moins des habitations. Le conseil des manufactures a cependant le droit d'admettre des exceptions, mais seulement en faveur des fabriques établies dans des conditions de perfectionnement qui annihilent entièrement les émanations dangereuses.

Il ressort de là que, quoiqu'il n'y ait pas encore de loi spéciale en Russie, l'administration se montre vigilante et se trouve sérieusement armée pour toutes les questions d'hygiène industrielle.

Serbie. — En Serbie, la loi sanitaire si bien faite et si complète du 30 mars 1881 permet au Conseil sanitaire de prescrire «les règlements sanitaires obligatoires en vertu desquels les

métiers et industries pourront être autorisés, et la santé des ouvriers préservée des conséquences du métier même ».

SUÈDE. — La loi sur la salubrité du royaume de Suède, du 25 septembre 1874, contient un certain nombre de prescriptions relatives à la salubrité extérieure, aux conditions d'installation, d'éloignement, de construction des usines et manufactures (art. 16 à 22).

L'hygiène intérieure n'est pas oubliée et le paragraphe 4 de l'article 16 spécifie qu'il doit être pris des précautions pour la santé des travailleurs [1].

La Suède a une loi spéciale sur le travail des enfants.

SUISSE. — La Suisse a réglementé par une loi unique (Loi fédérale du 23 mars 1877) les conditions de l'hygiène industrielle : salubrité intérieure, salubrité extérieure, durée du travail des adultes, prescriptions relatives au travail des femmes et des enfants.

Antérieurement à cette loi si complète, il y avait des lois sur l'industrie dans un certain nombre de cantons (Zurich, Glaris, Saint-Gall, Argovie, Thurgovie). Le canton de Lover-Unterwalden avait édicté une loi spéciale sur les fabriques d'allumettes. Dans beaucoup de cantons (Grisons, Berne, Schaffouse, Schwyz, Bâle), on avait au moins fixé dans les lois scolaires un minimum d'admission des enfants au travail industriel.

Ce rapide coup d'œil jeté sur la législation étrangère, en matière d'hygiène industrielle, permet de constater d'abord que toutes les nations se sont montrées soucieuses d'assurer une réglementation; et presque toutes l'ont étendue à la salubrité intérieure en même temps qu'à la salubrité extérieure, à l'hygiène de l'ouvrier, à la sécurité du travail, aux conditions particulières du travail des femmes et des enfants. Mais si certains pays ont encore sur chacun de ces points des lois spéciales, nous pouvons constater que dans les pays qui sont aujourd'hui nos plus heureux rivaux au point de vue de l'industrie : en Angleterre, en Suisse, en Allemagne, en Autriche, on a réuni en une loi unique les dispositions réglementaires relatives aux diverses questions d'hygiène industrielle; et il n'est pas

[1] 4° Le Comité veillera à ce que les conditions d'hygiène pour les *travailleurs*, les voisins de fabrique et autres ne soient pas défectueuses. Lorsqu'il y a des inconvénients, il prendra les précautions convenables pour les faire disparaître; si ces inconvénients sont graves et si l'on ne tient pas compte de ses prescriptions, il pourra suspendre l'industrie ou la fabrication.

douteux qu'on n'ait assuré ainsi une application plus rigoureuse, plus intelligente, plus conforme au progrès, des dispositions de la législation et des vues des législateurs.

Rappelons à présent ce qui existe en France.

Actuellement, en France, la législation relative à l'hygiène industrielle est représentée par trois séries de documents :

1° Le décret-loi du 15 octobre 1810, complété par l'ordonnance réglementaire du 14 janvier 1815 et par une série de décrets et d'ordonnances plus récents ;

2° La loi du 9 septembre 1848, complétée par le décret du 17 mai 1851, par celui du 31 janvier 1866, et enfin par la loi du 16 février 1883 ;

3° La loi du 19 mai 1874 et les règlements d'administration publique qui s'y réfèrent.

Le décret du 15 octobre 1810 s'est occupé uniquement des dangers, des incommodités ou des dommages qui pourraient résulter de la part des établissements industriels pour les voisins ou les cultures.

Ce n'était pas certainement la première mesure de ce genre que prenait l'administration française. Un règlement général applicable à la police de Paris et des autres villes du royaume, daté de 1567, prescrivait l'éloignement de certaines industries qui, comme celles des chiffonniers, des équarrisseurs, des tanneurs, n'avaient plus licence de s'exercer à l'intérieur des villes ; Tardieu cite même une sentence du Châtelet, du 4 novembre 1486, qui ordonna la suppression d'une fabrique de poterie sur les réclamations du voisinage. Mais on peut dire que c'est en 1806 d'abord qu'un préfet de police essaya de condenser les règles éparses de la jurisprudence, et que c'est seulement en 1810, qu'après avoir pris l'avis de l'Institut, le Ministre de l'intérieur fit rendre le décret impérial du 15 octobre. Il s'établit ainsi une législation sage et précise qui, malgré ses imperfections, restera comme un modèle de conception et de prévoyance, et qui est digne des hommes illustres qui furent ses parrains à l'Institut : Guyton de Morveau, Chaptal, G. Cuvier.

Ce décret a malheureusement oublié de s'intéresser aux habitants de l'usine ou de la manufacture elle-même, au travailleur de l'atelier. Il n'en fait nulle mention. Et bien qu'on eût pu dire que c'était là seulement un oubli de rédaction ; que cette protection de

l'ouvrier devait être dans la pensée du législateur et que la preuve s'en trouvait dans le premier tableau de classification des industries, qui rangeait la céruse dans la 3e classe avec cette mention : *quelques émanations nuisibles seulement pour la santé des ouvriers,* il n'y a, en fait, aucune phrase du décret qui puisse être interprétée dans ce sens; c'est au moins la doctrine du Comité consultatif des arts et manufactures [1].

La loi du 9 septembre 1848 ne s'occupe que de régler la durée journalière du travail et de fixer un maximum de 12 heures de travail effectif. Elle ne vise aucune autre condition d'hygiène industrielle; et comme elle ne s'applique qu'aux usines et manufactures, comme elle laisse absolument en dehors de sa sphère d'action les ateliers, comme elle ne parle ni des chantiers ni des mines, comme elle est compliquée des décrets très restrictifs du 17 mai 1851 et du 31 janvier 1866, les services qu'elle peut rendre sont très bornés; peut être même, malgré la loi du 16 février 1883 qui charge les commissions locales et les inspecteurs du travail des enfants d'en faire appliquer les dispositions restreintes, la loi de septembre 1848 ne peut-elle pas être sérieusement appliquée.

[1] Voici un exemple récent de la regrettable impuissance où se trouve laissée l'Administration en l'absence d'une loi protectrice de la santé du travailleur : à la date du 7 mai 1884, M. le Ministre du commerce écrivait au président du Comité consultatif : «Des cas de nécrose phosphorée ayant été constatés dans une fabrique d'allumettes chimiques qui existe à El-Biar, près Alger, le Conseil d'hygiène du département a délégué un de ses membres, le docteur Bertherand, pour visiter cet établissement. Sa mission terminée, ce praticien a soumis au Conseil différentes propositions dont l'une, qui tendrait à ne laisser admettre dans la fabrique aucun ouvrier présentant une carie pénétrante dentaire, a paru à quelques membres attentatoire à la liberté du travail. . . . . »

«La condition qui a soulevé des objections dans le sein du Conseil d'hygiène et de salubrité d'Alger ne saurait en effet, dans l'état actuel de la législation, être imposée à des industriels, et c'est dans ce sens que je viens de répondre à M. le Gouverneur général de l'Algérie.»

M. le Ministre était, en effet, dans l'impossibilité de faire exécuter les prescriptions d'ailleurs si sages du Conseil de salubrité d'Alger.

Dans un pays qui tient autant que tout autre à la liberté du travail, en Suisse, un canton n'a pas hésité à réglementer étroitement la fabrication des allumettes. Le canton de Lower-Unterwalden, par une loi sur les fabriques d'allumettes, a réglé les conditions de ventilation des ateliers et de manipulation des matières :

«Aucune personne de moins de 18 ans ne peut être employée dans ces fabriques, et un ouvrier qui se fait extraire une dent ne peut rentrer que quinze jours après l'opération. Le travail est interdit à tous jeunes gens ou jeunes filles atteints d'affections scrofuleuses ou ayant des dents cariées. Tous les trois mois, au frais du propriétaire, un médecin examine l'état de santé des ouvriers.» (Traduit de l'ouvrage de Ernst, Edler von Plener; appendice n° IX.)

La loi du 19 mai 1874 est une bonne loi qui pouvait être considérée à la fois, avant l'instruction primaire obligatoire, comme une loi scolaire préparatoire qui a rendu de ce chef de très grands services, et comme une loi d'hygiène industrielle. C'est la seule loi qui prescrive chez nous des mesures pour assurer la salubrité et la sécurité du travail (art. 13 et 14); mais comme elle ne s'applique qu'aux locaux où des enfants sont employés, l'industriel dont les ateliers sont insalubres, dont les machines et engrenages ne sont pas couverts, peut, s'il est réprimandé ou menacé d'un procès-verbal par l'inspection, se mettre en règle en renvoyant les enfants qu'il occupait. Cette manière d'assainir les ateliers et d'y assurer la sécurité en jetant les enfants sur le pavé n'est pas seulement paradoxale, elle est profondément immorale et singulièrement en désacord avec l'esprit d'une loi qui prétend assurer la protection de l'enfance industrielle.

En somme, ni le décret-loi du 15 octobre 1810, ni la loi du 9 septembre 1848, ni la loi du 19 mai 1874 ne peuvent permettre d'imposer dans les usines, manufactures, ateliers, chantiers, mines, etc., la salubrité et la sécurité de travail.

Si la dernière de ces lois prescrit en effet des mesures de protection de ce genre, elle les restreint aux cas où l'on emploie des enfants, et par cette restriction même elle va contre le but qu'elle se propose. Il y a là une lacune à combler; c'est ainsi que l'a compris M. le Ministre en demandant au Comité consultatif d'hygiène les éléments d'une loi sur l'hygiène industrielle.

C'est ici qu'il convient de rappeler les propositions déjà faites pour remédier à l'insuffisance de notre législation.

Le 11 novembre 1882, MM. Félix Faure et Martin Nadaud faisaient une *Proposition de loi* concernant l'hygiène et la sécurité du travail dans les manufactures, usines, mines, chantiers et ateliers. En voici les principaux articles :

Article premier. Les manufactures, fabriques, usines, mines, chantiers et ateliers sont soumis, en tout ce qui concerne leur salubrité et la sécurité des personnes qui y sont employées, à la surveillance des agents désignés par la présente loi.

Art. 2. Un règlement d'administration publique déterminera, dans les trois mois qui suivront la promulgation de la présente loi :

1° Les prescriptions applicables à tous les établissements industriels, relativement à la ventilation, à l'éclairage et à l'hygiène générale des ateliers;

2° Les prescriptions particulières aux usines à moteurs mécaniques, en tout ce qui concerne les précautions à prendre pour prévenir les accidents.

Art. 3. Les établissements reconnus dangereux ou insalubres, soit à cause des substances qui y sont employées, soit à cause des émanations qui s'y produisent, soit par la nature même du travail qui s'y pratique, seront l'objet de règlements spéciaux, rendus sur l'avis du Comité consultatif d'hygiène publique de France et du Comité consultatif des arts et manufactures.

Art. 5. Pour assurer l'exécution de la présente loi, il sera créé un corps d'inspecteurs des fabriques, qui sera chargé également des attributions confiées par la loi du 19 mai 1874 aux inspecteurs du travail des enfants et filles mineures dans les manufactures.

Un règlement d'administration publique déterminera les conditions dans lesquelles sera constitué le corps des inspecteurs de fabriques.

On remarquera que les auteurs du projet font intervenir à la fois, dans les questions d'hygiène industrielle, le Comité des arts et manufactures et le Comité consultatif d'hygiène. Rien ne nous semble plus juste, puisque, dans toute mesure restrictive applicable à la protection de l'ouvrier, il importe d'envisager à la fois les questions d'insalubrité qui sont de la compétence du Comité consultatif d'hygiène, et les difficultés techniques ou les nécessités industrielles qui sont de la compétencce du Comité consultatif des arts et manufactures. C'est à la conciliation de ces deux ordres d'intérêts que tend le projet de MM. Félix Faure et Martin Nadaud.

On verra plus loin que nous nous sommes efforcés aussi de concilier ces intérêts également respectables dans le projet de loi annexé à ce rapport.

Cette année même, le 10 mars 1884, M. Richard Waddington, rapporteur d'une commission parlementaire présidée par M. Martin Nadaud, terminait son remarquable rapport par une proposition de loi dont voici les articles principaux :

Article premier. Le travail effectif de l'ouvrier dans les manufactures et usines ne pourra pas excéder dix heures par jour, ni six jours par semaine.

Art. 2. Le travail de nuit, dans les établissements visés par l'article 1er, est interdit aux femmes.

Tout travail entre huit heures du soir et cinq heures du matin est considéré comme travail de nuit.

Toutefois, en cas de chômage résultant d'une interruption accidentelle et de force majeure, l'interdiction ci-dessus pourra être temporairement levée et pour un délai déterminé par la Commission locale ou l'Inspecteur institué par la loi du 19 mai 1874.

Art. 3. Des règlements d'administration publique détermineront les exceptions qu'il sera nécessaire d'apporter aux dispositions contenues dans les articles 1 et 2, à raison de la nature des industries ou des causes de force majeure.

Art. 5. Les dispositions exigées par l'article 14 de la loi du 19 mai 1874 sont applicables à toutes les usines et manufactures sans distinction.

Art. 6. Les Commissions locales et les inspecteurs du travail des enfants dans les manufactures institués par la loi de 1874 sont chargés de surveiller l'application de la présente loi.

Ce qui nous intéresse tout particulièrement ici, c'est-à-dire la salubrité et la sécurité du travail, se trouverait réglé, d'après le projet de M. Waddington, par l'article 14 de la loi sur le travail des enfants, qui est ainsi conçu :

Art. 14. Les ateliers doivent être tenus dans un état constant de propreté et convenablement ventilés.

Ils doivent présenter toutes les conditions de sécurité et de salubrité nécessaires à la santé des enfants.

Dans les usines à moteurs mécaniques, les roues, les courroies, les engrenages ou tout autre appareil, dans le cas où il aura été constaté qu'ils présentent une cause de danger, seront séparés des ouvriers de telle manière que l'approche n'en soit possible que pour les besoins du service.

Les puits, trappes et ouvertures de descente doivent être clôturés.

Cet article serait dorénavant applicable à toutes les *usines* et *manufactures,* qu'on y emploie ou non des enfants. Ce serait un progrès réel, bien que restreint encore, puisque, en s'en tenant à la lettre, ce projet laisse de côté les mines, les chantiers et les petits ateliers.

Il est intéressant de remarquer que le projet de MM. Félix Faure et Martin Nadaud parle d'organiser un corps d'inspecteurs des fabriques et de lui confier l'inspection du travail des enfants, tandis que M. Waddington propose de confier aux inspecteurs du travail des enfants l'inspection hygiénique des usines et manufactures. Il ne serait pas indifférent d'adopter l'une ou l'autre formule parce que le recrutement ne saurait être le même dans les deux cas, et que si l'on venait à créer de nouvelles places d'inspecteur du travail des enfants dans les conditions actuelles de recrutement, on se trouverait, au moment où une loi d'hygiène industrielle serait promulguée, en présence d'un corps de fonctionnaires insuffisamment préparés à leurs nouveaux devoirs.

Remarquons enfin que tandis que le projet de MM. Félix Faure et Martin Nadaud fait appel aux conseils et au contrôle du Comité consultatif des arts et manufactures et du Comité consultatif d'hygiène, le projet de M. Richard Waddington, meilleur à d'autres égards, ne s'adresse qu'aux commissions locales établies

par la loi du 19 mai 1874 et dont le zèle très réel n'implique pas une compétence suffisante en matière d'hygiène.

Quoi qu'il en soit, on voit par ce que nous venons de dire que plusieurs fois dans le Parlement on s'est préoccupé de la nécessité de combler une lacune de notre législation en matière d'hygiène industrielle. La commission en trouvait la preuve dans les importants rapports de MM. Félix Faure, Martin Nadaud et Waddington; et elle y puisait de précieux renseignements pour son travail.

II

La lacune de la législation qu'il s'agit aujourd'hui de combler comprend à la fois la salubrité et la sécurité de l'atelier.

Cela constitue tout naturellement deux titres distincts.

C'est ce qu'indique nettement l'article 1er du projet de loi élaboré par la commission.

L'article 2 établit un corps spécial d'inspecteurs du travail industriel.

L'article 3 décide que le Comité consultatif d'hygiène publique de France préside, sous l'autorité du Ministre et avec le concours du Comité consultatif des arts et manufactures, à l'uniformité de l'application de la loi. C'est là une disposition dont on comprend la nécessité. S'il est en effet légitime que le Comité consultatif d'hygiène préside à l'application de mesures essentiellement hygiéniques et qui sont, par définition même, de sa compétence; si c'est là un premier pas fait dans la voie désirable de la centralisation des services sanitaires, le Comité ne saurait ni ne voudrait se passer des lumières du Comité des arts et manufactures, auquel il désire, au contraire, qu'il soit fait appel pour s'éclairer sur certaines difficultés techniques qui pourraient rendre difficile l'application immédiate de mesures hygiéniques d'ailleurs justifiées, ou sur l'opportunité de sursis et de tempéraments réclamés par les conditions économiques permanentes ou passagères de telle ou telle branche de l'industrie.

Les articles 4, 5, 6, 7, 8 du projet de loi ci-annexé forment le titre II et s'occupent des pénalités. On s'est inspiré ici des articles similaires de la loi du 19 mai 1874 sur le travail des enfants. On avait tout d'abord pensé à donner à ces amendes une attribution définie et à en faire bénéficier les sociétés de secours mutuels et les bureaux de bienfaisance, mais on a, après discus-

sion, pensé qu'il convenait de réserver la question, qui se trouverait aisément résolue si, comme on paraît décidé à le faire, on organisait une assurance obligatoire pour les travailleurs, en votant une loi analogue dans son principe à la loi allemande du 15 juin 1883.

Nous aurions bien voulu, pour des contraventions si variables, introduire dans un article spécial une sorte d'échelle des peines. Nous n'avons pas cru que cela fût possible au début. Plus tard, éclairé par l'expérience, le législateur pourra, et quand il le pourra il le devra, donner plus d'extension et de précision à cette partie de la loi, de manière à diminuer l'arbitraire du juge.

La raison exige qu'il soit tenu compte dans une loi nouvelle, telle que celle-ci, de la nécessité pour l'industrie de modifier gravement, dans beaucoup de cas, ses installations actuelles. Sans rien abandonner du principe supérieur de protection de la vie humaine, nous avons pensé qu'il conviendrait, dans des dispositions transitoires qui constituent le titre III et l'article 9 du projet de loi, de fixer une période de tolérance et de donner au Ministre le droit d'accorder des sursis dont la durée sera variable suivant les espèces. Comme ces sursis ne seront accordés qu'après avoir entendu le Comité consultatif d'hygiène, et comme celui-ci sera éclairé sur les difficultés techniques par le préavis du Comité des arts et manufactures, on peut être assuré de trouver dans cette disposition transitoire, et dans celles qu'on jugerait utile d'admettre par décret, une garantie pour le travailleur, pour l'industrie, et aussi pour l'Administration.

On remarquera que nous n'avons pas voulu donner à l'article 1er de la loi, qui vise les conditions de salubrité et de sécurité, des développements trop étendus. Il suffit que des principes soient nettement formulés; qu'une loi, toujours difficile à modifier quand on est parvenu à l'obtenir, arme l'Administration et lui permette d'intervenir et d'étendre son action par voie de décret. C'est un défaut de plusieurs lois étrangères, de la loi anglaise notamment et un peu aussi de la loi suisse, de vouloir trop définir. Les conditions de l'industrie changent tous les jours; tel procédé de fabrication actuellement dangereux et insalubre sera remplacé demain par un procédé sans danger; il convient en ces matières de prévoir le progrès et de laisser une sage latitude à l'action administrative. Une loi précise et simple, permettant de procéder par règlements d'administration publique, incessamment

modifiables, est infiniment plus prudente qu'une loi trop étendue et qui veut tout prévoir.

Le projet de règlement relatif à la salubrité et à la sécurité, que nous avons étudié et que nous proposons en exécution de l'article 1er de la loi, entre au contraire dans les détails nécessaires.

Il exige d'abord, à l'imitation de la loi anglaise [1], que les locaux occupés par les travailleurs soient tenus dans un état constant de salubrité générale, en dehors même des conditions du travail (émanations des fossés, latrines, égouts, encombrement, aération). Il prescrit en même temps de prendre les précautions convenables contre les dégagements pulvérulents ou gazeux, d'établir une ventilation artificielle pour les cas où l'aération naturelle ne serait pas possible à cause des conditions de la fabrication, ce qui peut être le cas de certaines filatures, etc.

Il nous semble en effet qu'il ne servirait de rien de prendre des précautions contre les inconvénients du travail si l'on ne prévoyait aussi les dangers qui naissent de l'encombrement, d'une aération défectueuse, d'un éclairage insuffisant, de la présence de latrines immondes, comme il est de règle d'en rencontrer aujourd'hui dans la plupart des maisons ouvrières et dans les ateliers, si l'on ne se préoccupait en un mot des conditions de salubrité de l'atelier considéré comme un logement où les ouvriers passent la moitié de leur temps.

Actuellement, s'il n'existe pas de loi qui vise la salubrité intérieure des industries, il existe, il est vrai, une loi sur les logements

[1] Extraits du *Factory and Worckstrop Act* de 1878. — 3. Une manufacture et un atelier doivent être tenus en état de propreté et délivrés de toute émanation provenant d'un fossé, de lieux privés ou de toute autre cause insalubre.

Une manufacture ou un atelier ne doit pas être rempli de monde, pendant les heures de travail, au point de nuire à la santé des employés, et doit être aéré de façon à rendre inoffensifs, autant que possible, tous les gaz, vapeurs, poussières et autres impuretés engendrées par la fabrication des produits ou par la main-d'œuvre.

Toute manufacture ou tout atelier qui contreviendront aux dispositions de cette section seront considérés comme n'étant pas tenus conformément à la loi.

4. Lorsqu'il vient à la connaissance de l'inspecteur qu'il a été commis dans la manufacture ou l'atelier un acte de négligence, ou qu'il existe un défaut dans la tenue des fossés, water-closets, enclos-communs, cendriers, puits, ou tout autre délit dont il n'est pas parlé dans l'acte, mais qui est passible de la loi sur la salubrité publique, l'inspecteur donnera avis, par écrit, de l'acte de négligence ou du manquement à l'autorité sanitaire du district dans lequel est situé la manufacture ou l'atelier, et l'autorité sanitaire aura pour devoir de faire telle enquête que l'avis comportera et de prendre telle décision qu'elle jugera propre à atteindre le but de la loi.

L'inspecteur peut, pour les besoins de cette section, prendra avec lui dans l'intérieur de la manufacture ou de l'atelier un officier médical de santé, un inspecteur de salubrité, ou tout autre agent de l'autorité sanitaire.

insalubres (Loi du 13 avril 1850)[1]; mais, entre autres imperfections reconnues, cette loi ne s'applique pas aux ateliers qui ne sont pas considérés comme des logements permanents. Il est rationnel de faire état de ce desideratum dans une loi sur l'hygiène des ateliers, puisque l'habitation à l'atelier présente des conditions complexes d'hygiène générale et spéciale que les commissions des logements insalubres pourraient mal connaître et qui seraient plus aisément reconnues et qualifiées par des inspecteurs compétents.

Nous avons introduit dans ce règlement une disposition visant les interruptions journalières du travail, prescrivant d'aérer les ateliers pendant le temps de cette interruption, et interdisant de laisser les ouvriers prendre leurs repas dans l'atelier.

La large ouverture des fenêtres pendant les interruptions du travail est une mesure d'hygiène essentielle; il n'y a pas de meilleur mode d'aération, d'évacuation de cet air souillé par la présence d'un personnel nombreux et où pullulent si facilement les microrganismes quand il reste confiné. Si l'on reste dans l'atelier pendant les interruptions de travail, si surtout on y prend les repas, l'animalisation de l'air atteint un degré dangereux. La question des repas pris en dehors de l'atelier est réglée par la loi anglaise (art. 17 du *Factory Act* de 1878)[2], par la loi danoise du 23 mai 1873 (art. 4)[3], par la loi suisse du 23 mars 1873, qui va plus loin que nous n'oserions aller et qui demande que des locaux convenablement chauffés soient mis à la disposition des ouvriers pour leurs repas[4].

[1] Tome I, p. 134.

[2] Angleterre. — *Factory Act* de 1878 :

Art. 17. Au sujet des repas (sauf les exceptions spécialement indiquées dans le présent *Act*), les règles suivantes seront observées dans les manufactures et ateliers :

1° Tous les enfants, adultes et femmes doivent prendre leurs repas à la même heure du jour.

2° Un enfant, un adulte ou une femme ne pourront, sous aucun prétexte, travailler pendant les heures de repas, ni même rester à l'atelier où se fabriquent les produits.

[3] Danemark. — Loi du 23 mai 1873 :

Art. 4. Les enfants et les jeunes gens... ne pourront, durant leurs repas, rester dans aucun local de la fabrique ou de l'atelier au moment où l'on y travaille. Si, par suite de la nature du travail, l'air du local se remplit de poussière ou d'autres matières nuisibles à la santé, la police sanitaire pourra demander qu'il soit assigné aux travailleurs un local particulier pour y rester pendant les heures de repos et pour y prendre leurs repas.

[4] Suisse. — Loi fédérale du 23 mars 1877 :

Art. 11, § 5. On accordera aux ouvriers, au milieu de la journée de travail, un

D'ailleurs, dans certaines professions où l'on fabrique ou bien où l'on emploie des substance toxiques, il n'est pas prudent de prendre ses repas dans l'atelier où les poussières seraient ainsi plus aisément absorbées et trouveraient dans le tube digestif une voie plus rapide et plus sûre d'intoxication. C'est par exemple ce qu'on peut dire de toutes les professions qui travaillent ou emploient le plomb. Ces préoccupations ne se sont pas seulement montrées à l'étranger; on en retrouve la preuve dans les travaux des hygiénistes et dans les actes des administrateurs français. Dans une circulaire de M. le Préfet de police, en date du 24 janvier 1882, préparée par le Conseil d'hygiène de la Seine sur le rapport de M. Gautier, il est dit «qu'on ne doit pas laisser les ouvriers séjourner, et encore moins prendre leurs repas, dans les enceintes où se dégageraient notoirement des poussières contenant du plomb». De son côté, le Comité consultatif d'hygiène publique de France, dans un projet de règlement sur les fabriques de céruse et de minium[1], a fait de cette défense un article spécial : (Art. 10. Aucun repas ne pourra être pris dans l'intérieur de l'usine[2].)

Nous n'avons pas hésité non plus à faire entrer dans le règlement relatif à la salubrité de l'atelier des prescriptions qui touchent à la fois à l'assainissement et à la simple propreté. C'est ainsi par exemple que, pour les cas où l'atelier, l'usine, la fabrique, envoient leurs eaux résiduaires ou leurs eaux de lavages à un égout, soit public, soit privé, on a demandé que toute communication entre l'égout et l'établissement industriel soit munie d'un intercepteur hydraulique fréquemment nettoyé et abondamment lavé au moins une fois par jour. Pour les cabinets d'aisances, en nombre suffisant[3], exigés par le projet de règlement, des précautions

repos d'une heure au moins pour le repas; des locaux convenables, chauffés en hiver, et hors des salles ordinaires de travail, seront mis gratuitement à la disposition des ouvriers qui apportent ou se font apporter leur repas à la fabrique.

(1) Tome XII, p. 190.

(2) Ces précautions s'appliquaient en Prusse, dès 1865, aux ateliers où l'on emploie l'arsenic. Un décret du 10 juin 1865, relatif à l'établissement des fabriques d'aniline, contient la défense formelle de laisser les ouvriers prendre leurs repas dans les ateliers.

(3) Il ne paraîtrait pas excessif d'indiquer le nombre de cabinets d'aisances nécessaires pour un nombre déterminé d'ouvriers. De telles prescriptions ont maintes fois été faites. Le projet de règlement, récemment mis à l'enquête pour l'assainissement de Paris, prescrit un cabinet d'aisances par logement; et en recherchant dans la table chronologique des règlements de voirie nous avons trouvé la mention suivante :

«Du 24 septembre 1668. — Ordonnance de M. le Prévôt de Paris ou son Lieute-

analogues devraient être prises, c'est-à-dire que les cuvettes seraient à fermeture hermétique avec inflexion siphoïde du tuyau de chute et provision d'eau abondante.

Les raisons de ces prescriptions n'ont pas besoin d'être expliquées; il n'est pas un hygiéniste qui ne reconnaisse l'utilité d'établir entre l'habitation, même temporaire, et les points d'évacuation de tous les résidus organiques, une interception hydraulique, qui seule empêche efficacement le retour des odeurs et émanations quelconques dans les habitations. Mais nous tenons à faire remarquer que la nécessité d'une telle prescription devient impérieuse quand il s'agit des ateliers. L'appel déterminé par les cheminées industrielles et qu'il est si utile souvent de rendre énergique pour enlever les buées, vapeurs et gaz engendrés par le travail, l'appel des ventilateurs, usités pour l'enlèvement des poussières, tendent à favoriser et à rendre plus dangereux ces reflux gazeux des égouts ou des fosses, surtout quand les fenêtres sont fermées; il serait étrange qu'on prît des mesures pour l'évacuation par aspiration des vapeurs, gaz, poussières irritantes ou toxiques, et qu'on fît du même coup pénétrer dans l'atelier un air chargé de miasmes infectieux; ça serait d'une hygiène imprévoyante que de chercher à protéger les ouvriers contre les irritations bronchiques, contre le saturnisme, l'hydrargyrisme, etc., et de leur apporter en même temps les germes de la fièvre typhoïde.

C'est aussi contre des dangers du même ordre que nous avons pris soin d'assurer le nettoyage du sol et des parois dans tous les ateliers quelconques, et que nous nous sommes attachés dans un article spécial à prescrire des précautions particulières pour les locaux où l'on travaille et où l'on emmagasine des matières organiques. Le sol dans ce cas doit être imperméable, les murs convenablements enduits doivent être stuckés ou silicatés ou recouverts d'une épaisse couche de peinture à l'huile à base de zinc. Indépendamment d'une question grave d'hygiène, le choix de la peinture à base de zinc est motivé dans ces ateliers, comme dans les cabinets d'aisances, par la coloration noirâtre qui résulte de la sulfuration pour les peintures à base de plomb. D'ailleurs le sol et les murs doivent être fréquemment lavés avec une solution désinfectante, et

«nant de police, portant nouveau règlement général à tous les propriétaires et locataires des maisons de la Ville et Faux bourgs de Paris, pour la construction de la «quantité suffisante de latrines, à proportion de la grandeur et nombre des habitants «de chaque maison.»

les résidus putrescibles ne doivent jamais séjourner dans les locaux affectés au travail. Ce ne seront pas là d'ailleurs des prescriptions nouvelles : elles sont proposées déjà fréquemment par les conseils d'hygiène, pour les abattoirs, les fondoirs, les chantiers d'équarrissage, les boyauderies, les dépôts de chiffons, etc. Mais elles devaient trouver leur place naturelle dans un règlement sur la salubrité intérieure des établissements industriels[1].

Nous demandons aussi qu'il soit pris des mesures pour assurer la ventilation artificielle et l'aération naturelle de l'atelier. Il s'agit ici, en dehors de toute cause de viciation résultant du travail, de remédier aux dangers de l'encombrement. Ces mesures générales sont indépendantes de celles, toutes spéciales, qui doivent être prises contre les émanations industrielles. Ces émanations se produisent dans les usines, manufactures, ateliers, tantôt sous la forme de gaz ou de vapeurs, tantôt sous la forme de poussières.

S'il s'agit de vapeurs ou de gaz, il peut se trouver qu'on ait affaire à des corps gazeux légers ou lourds, tendant à s'élever ou tendant à gagner les couches inférieures de l'atmosphère. Il en est de même des poussières. — Disons d'abord que dans tous les cas l'évacuation devra se faire au moment même et au lieu même de la production. La ventilation générale des locaux peut en effet, dans de telles circonstances, être plus nuisible qu'utile; elle peut avoir pour conséquence de mêler à l'atmosphère tout entière de l'atelier les émanations nuisibles, irritantes ou toxiques, et de répandre le danger qui doit être au contraire localisé. C'est pourquoi pour tous les dégagements légers, qu'ils soient gazeux ou pulvérulents, les tables ou fourneaux devraient être munis de hottes communiquant à des cheminées d'appel de bon tirage. Pour les poussières plus lourdes et même pour toutes les poussières sans exception, il se-

[1] Il est évident que les prescriptions faites par le règlement pour les établissements où l'on emploie des substances organiques auront souvent besoin d'être complétées par voie de circulaires. C'est par des circulaires en effet que des instructions pourront être données sur les mesures à prendre contre le danger du charbon et de la pustule maligne dans les abattoirs, les chantiers d'équarrissage, les boyauderies, etc. C'est aussi par des circulaires qu'on pourrait mettre en garde les ouvriers qui travaillent les chiffons contre la transmission de maladies infectieuses, indigènes ou exotiques. Par exemple, pour les chiffons, il est certain que la transmission de la variole n'a, quelquefois, pas eu d'autre cause. Mais conviendrait-il d'exiger par voie de règlement que les ouvriers des dépôts de chiffons et des papeteries soient régulièrement revaccinés? Ne serait-ce pas une exigence excessive? Et ne pourrait-on pas dire que c'est établir la revaccination obligatoire, si désirable sans doute, mais non encore légale. Des circulaires, des instructions sont au contraire très légitimes dans de tels cas.

rait bon d'exiger dans certains cas que les appareils ou machines fussent enveloppés de tambours ou de chemises de bois ou de tôle mis en communication avec un ventilateur aspirant; enfin pour les gaz lourds (vapeurs mercurielles, sulfure de carbone), une ventilation *per descensum* est indispensable.

Un règlement n'a pas à indiquer pour toutes les industries ce qu'il convient de faire des dégagements; il peut exiger seulement qu'ils soient évacués hors de l'atelier au moment même et au point même de leur production, et qu'ils ne soient pas jetés librement dans l'atmosphère. Suivant les cas, les gaz ou vapeurs pourront être condensés ou brûlés, les poussières seront dirigées sous les foyers ou recueillies dans des caisses à chicane ou dans des chambres à poussière : ce sont des questions d'espèce et les solutions varieront avec le genre d'industrie, avec la possibilité d'utiliser ou non les dégagements produits.

Nous avons, à dessein, négligé d'imposer des appareils individuels tels que masques, respirateurs, etc. On peut, par voie de circulaire, en recommander l'emploi, mais il ne nous a pas paru qu'on pût en exiger l'usage. Ce sont d'ailleurs presque toujours des moyens de protection insuffisants que ceux qui nécessitent à chaque instant la coopération volontaire de l'ouvrier, il ne s'y soumet qu'avec répugnance et même il met une sorte de point d'honneur à s'en affranchir; les meilleurs moyens de le préserver des dégagements nuisibles sont ceux qui, par leur automatisme, laissent tout à fait en dehors le libre arbitre du travailleur [1].

Il peut arriver que les poussières nuisibles ne soient pas un produit accessoire et résiduaire du travail; que ce soit au contraire le but même de ce travail (pulvérisation de la belladone, de la céruse, etc., etc.) : nous avons pensé que le règlement devait étendre à ces faits sa prévoyance et exiger que les opérations se fassent en appareils clos.

Les progrès de la mécanique ont permis, dans certains ateliers, d'établir des appareils sans danger pour le travail de matières pulvérulentes éminemment toxiques; les exemples ne manquent

[1] Il existe cependant des professions comme celles des piqueurs de grès, des ouvriers des carrières de pierres dures, où l'usage du masque rendrait de grands services. Tous les hygiénistes connaissent les conditions défectueuses de santé des ouvriers de Fontainebleau et de la Ferté-sous-Jouarre; tous savent que des masques ont été conseillés (absorbant hydraulique de Poirel, voile de Mercier), mais que les ouvriers se montrent insoucieux de ce moyen de protection. La réglementation serait ici impuissante, et il ne faut rien attendre que de l'éducation.

pas, qu'on pourrait imiter sans beaucoup de frais et en réalisant une économie véritable de la santé des ouvriers.

Enfin, en même temps que nous indiquions la nécessité de ne pas laisser les ouvriers prendre leur repas à l'atelier, nous avons demandé que les patrons mettent à la disposition de leur personnel les moyens d'assurer la propreté individuelle : vestiaires pour les vêtements de travail, lavabos et eau de bonne qualité. Nous connaissons des ateliers bien tenus, où de telles facilités sont données aux travailleurs; nous ajoutons qu'elles constituent des précautions indispensables; si, en effet, quittant l'atelier pour aller prendre son repas au dehors, l'ouvrier emporte avec lui sur sa blouse de travail, sur ses mains, sous ses ongles, sur le visage, des matières pulvérulentes toxiques, l'intoxication professionnelle ne sera pas évitée, et il est bon de savoir que chez certains typographes, chez les fondeurs de caractères, chez les fabricants de plomb de chasse, chez tous ceux qui manient le plomb et ses sels, le saturnisme n'a souvent pas d'autre cause que l'ingestion de particules toxiques restées sur la peau ou mêlées à la crasse sous-unguéale.

Ce projet de règlement ne s'applique qu'aux manufactures, usines, fabriques, ateliers considérés en général; il est bien certain qu'il faudra plus tard réglementer le travail dans de certaines conditions spéciales, et notamment dans les chantiers dont nous ne pouvons nous dispenser de dire un mot dans ce rapport.

Les grands chantiers de terrassement, les chantiers maritimes présentent en effet des conditions et des dangers d'un caractère particulier. Les grands remuements de terre exposent les travailleurs aux accidents de l'impaludisme, et c'est de quoi les hygiénistes se sont préoccupés à diverses reprises. En 1881, le docteur Gibert, du Havre, saisissait la Société de médecine publique et d'hygiène professionnelle d'une demande de consultation à l'occasion de l'exécution projetée du canal de Tancarville. Presque en même temps, M. le Ministre des travaux publics sollicitait l'avis de l'Académie de médecine sur les mesures de précaution et sur les soins à donner aux ouvriers en vue des travaux à exécuter sur le littoral maritime. A l'Académie de médecine, comme à la Société de médecine publique, ce fut M. le docteur Léon Colin qui rédigea la réponse. Il envisagea successivement l'éventualité des mesures à prendre à l'égard des ouvriers et à l'égard du sol, et recommanda :

A. *A l'égard des ouvriers.* — 1° Embauchage d'individus robustes, in-

demnes d'affection palustre antérieure; 2° suspension des travaux pendant les mois de juillet et d'août; 3° installation des ouvriers, pendant la nuit, dans les centres de population voisins, ou dans des baraques bien closes; 4° allumage, matin et soir, de grands feux au voisinage du chantier; 5° augmentation de la résistance individuelle par l'interdiction du travail à jeun, par une alimentation substantielle, par l'usage de la flanelle; 6° envoi immédiat de tout malade à l'hôpital le plus voisin; 7° surveillance spéciale des sortants de l'hôpital, au point de vue des vêtements, de l'alimentation, et de la continuation, pendant quelques semaines, de la médication spécifique.

B. *A l'égard du sol.* — 8° Utilisation des travaux du canal et du canal lui-même pour assainir la contrée; 9° aplanissement immédiat et drainage des terrains remués; 10° transport direct et aussi rapide que possible des matériaux de déblais sur les points où il y a quelque nivellement à opérer; 11° ensemencement et culture intensive de ces terrains.

Il y aurait lieu de s'inspirer de ces idées quand on en viendra à faire un règlement sur ce point particulier, et il est certain qu'alors il faudra faire un départ entre les prescriptions qui sont de nature à être imposées par décret et celles, d'un caractère moins précis, pouvant utilement faire l'objet d'une circulaire.

Il sera également nécessaire d'y ajouter certaines conditions applicables aux chantiers maritimes et à l'usage des appareils destinés au travail sous-marin.

Une première prescription qui serait à faire et sur laquelle nous insistons dès aujourd'hui serait relative au coucher des ouvriers, qui ne doit pas avoir lieu sur les travaux, mais dans les centres de population voisins; et, si le chantier est éloigné de tout centre habité, il y aurait lieu d'exiger que les entrepreneurs installent les baraquements destinés aux ouvriers à une distance convenable des travaux et de préférence sur un point élevé. L'installation à la charge de l'entrepreneur existe souvent dans la pratique; elle est tout à fait indiquée pour certains travaux effectués à grande distance des lieux habités. En Hongrie, la loi de 1876 en fait une obligation et exige même que les ouvriers soient soignés en cas de maladie[1].

[1] Hongrie. — Loi XIV de l'an 1876, sur l'organisation de l'hygiène publique en Hongrie.

Art. 15. — L'autorité veillera à ce que les industries existantes n'exercent pas une influence nocive pour l'hygiène publique.

Elle prendra les mesures nécessaires pour empêcher et régler l'exercice des industries insalubres qui ne tombent pas sous le coup de la loi sur les industries de 1872.

Elle est chargée, enfin, de veiller à ce que les ouvriers employés aux grands travaux publics dans les chantiers éloignés des communes, et qui se trouvent par conséquent dans l'impossibilité de pourvoir à leur placement, soient installés à la charge et par les soins des entrepreneurs de travaux et administrations, et qu'ils soient soignés en cas de maladie.

Le transport immédiat des déblais nous paraîtrait aussi devoir être prévu par une disposition réglementaire ; c'est une prescription vraiment importante qui pourrait se trouver complétée, par voie de circulaire, par la recommandation de livrer les remblais et banquettes à l'ensemencement et à une culture intensive.

Un tel règlement spécial devrait viser les cas où l'on emploierait dans les chantiers fluviaux et maritimes les scaphandres ou cloches à plongeurs, l'appareil Triger ou tout autre système à air comprimé ; alors il deviendrait facile, pour l'Administration, d'indiquer dans des *instructions* spéciales les précautions à prendre, les règles à observer pour écarter tout danger ou pour soigner immédiatement les ouvriers qui viendraient à présenter des accidents dus à la brusque décompression de l'air.

Autant et plus que dans les ateliers, il faudrait signaler dans les chantiers la nécessité d'approvisionner le personnel d'eau potable et obliger l'entrepreneur à établir un système de vidanges par tinettes mobiles. Rien n'est plus fréquent, en effet, que les épidémies coïncidant avec la dissémination de matières fécales sur le sol autour d'un campement. Sans remonter jusqu'à Moïse et à ses prescriptions hygiéniques, si sages dans de tels cas, on trouverait aisément, dans les travaux des médecins militaires, des preuves de cette cause de danger et des indications pour éviter l'infection des campements par des installations convenables de latrines.

Enfin, nous pensons qu'il serait sage d'introduire, par voie de règlement, cette indication, que les cahiers des charges devront prévoir pour tous les grands travaux, publics ou privés, les conditions d'hygiène des ouvriers.

Il va de soi qu'un tel règlement aurait besoin d'être commenté par des circulaires et qu'on pourrait alors recommander que, dans l'intérêt même des travailleurs, on choisît de préférence pour les grands terrassements des sujets robustes, indemnes d'accidents palustres antérieurs ; que, dans le cas d'accès de fièvre intermittente, les ouvriers soient vite éloignés des travaux et qu'ils ne reviennent au chantier que guéris et sous la condition de continuer quelque temps le traitement spécifique. On pourrait en même temps rappeler qu'il a été proposé d'allumer matin et soir de grands feux au voisinage des chantiers, et que, sans attacher à cette mesure une importance exagérée, c'est un essai qui mérite d'être tenté.

La commission a envisagé toutes ces éventualités et a cru

devoir fixer dès aujourd'hui quelques jalons pour un règlement qui s'imposera plus tard. Mais ce règlement, elle ne croit pas utile de l'annexer aujourd'hui à son projet de loi, pas plus qu'elle ne pense que le moment soit venu de faire un règlement relatif à l'hygiène des mines et à l'hygiène des ouvriers employés au percement des tunnels. Le règlement plus général qui vise la salubrité et la sécurité du travail des ateliers est au contraire un commentaire indispensable du projet de loi. Nous venons d'exposer plus haut les conditions générales qu'il impose pour la salubrité; arrivons à l'examen de ce qui est nécessaire pour assurer la sécurité [1].

A ce point de vue le règlement vise les dangers qui résultent de l'entassement des machines, des passages insuffisants ménagés entre elles, et prévoit les cas où des entourages et barrières seraient nécessaires. Il s'occupe des dangers qui résultent du mouvement des diverses pièces des machines. Enfin, il oblige les chefs d'établissements industriels à aviser immédiatement l'autorité char-

[1] La plupart des lois étrangères sur l'hygiène industrielle s'occupent de la sécurité du travail :

Suisse. — *Loi fédérale du 23 mars 1877, art. 2.* Les ateliers, les machines et les engins doivent, dans toutes les fabriques, être établis et maintenus de façon à sauvegarder le mieux possible la santé et la vie des ouvriers.

On veillera en particulier à ce que les ateliers soient bien éclairés pendant les heures de travail, à ce que l'atmosphère soit autant que possible dégagée de la poussière qui s'y forme, à ce que l'air s'y renouvelle toujours dans une mesure proportionnée au nombre des ouvriers, aux appareils d'éclairage, et aux émanations délétères qui peuvent s'y produire.

Les parties des machines et les courroies de transmission qui offrent des dangers pour les ouvriers seront soigneusement renfermées.

Danemark. — *Loi du 23 mai 1873, art. 11.* Les lieux de travail en question, ainsi que les travaux et les machines qui s'y trouvent, doivent être disposés de telle façon que la santé, la vie et les membres des travailleurs soient protégés de la manière la plus convenable, tant pendant la fabrication que pendant le séjour dans le local du travail. Toutes les parties courantes des machines ainsi que les instruments mis en mouvement mécaniquement par les machines, et avec lesquel les enfants ou les jeunes gens travaillant dans la fabrique ou dans l'atelier pourraient se trouver en contact, soit en passant, soit pendant leurs travaux ordinaires, doivent être solidement enclos, autant que le permet la nature des machines et du travail, et il est défendu d'enlever l'enclos pendant que les machines fonctionnent.

Les enfants et les jeunes gens ne doivent être employés à nettoyer aucune partie des machines d'une fabrique ou d'un atelier pendant qu'elles sont en mouvement.

Espagne. — *Loi du 24 juillet 1873 sur le travail des enfants, art. 9.* A dater de la promulgation de cette loi on ne construira aucun des établissements dont parle l'article premier sans que les plans aient été préalablement soumis à l'examen d'un jury mixte et qu'ils aient obtenu son approbation en ce qui touche les précautions indispensables d'hygiène et de sécurité des ouvriers.

gée de la police locale et le service d'inspection des accidents qui pourraient se produire [1].

Nous n'avons pas voulu prévoir dans ce règlement général les précautions à prendre contre les dangers d'incendie [2]. Il nous a paru que c'était là matière à un règlement spécial ultérieur.

Le projet de décret est entré dans des détails relativement au passage des ouvriers entre les diverses machines, et il a fixé la largeur de ces passages à un minimum de 60 centimètres, qui a paru suffisant, après que le rapporteur s'est assuré des dimensions de ces passages dans un atelier modèle, l'imprimerie de M. Chaix, rue Bergère [3]. Peut-être y aurait-il lieu de donner plus de largeur aux passages dans les ateliers où travaillent les femmes, dont les jupes flottantes peuvent être une cause particulière de danger; peut-être aussi conviendrait-il de recommander aux ouvriers de porter exclusivement dans les ateliers à moteurs mécaniques ces vêtements de toile ajustés, dont ils comprennent si bien l'utilité qu'ils en prennent chaque jour spontanément l'usage; mais c'est l'affaire d'instructions spéciales, et ça ne peut être l'objet de prescriptions réglementaires, quoiqu'on n'ait pas hésité à l'introduire dans le projet de réglementation allemand cité plus loin.

Le règlement s'occupe encore des barrières d'entourage des machines, des puits, des trappes, des cuves, des bassins; il indique la nécessité de précautions de sécurité contre les dangers des monte-charges, ascenseurs, élévateurs; il vise les dangers des échafaudages et tend ainsi à généraliser les mesures édictées à Paris par M. le Préfet de police; il spécifie les dangers qui résultent de certaines pièces saillantes des machines: courroies, bielles, engrenages, et prescrit des garde-mains, des grilles, des

[1] Suisse. — *Loi fédérale du 23 mars 1877, art. 4.* Le propriétaire de fabrique est tenu d'avertir immédiatement l'autorité locale compétente de tous les cas de lésions graves ou de mort violente survenus dans son établissement.

[2] Allemagne. — *Projet de règlement allemand, A.* § 7: Dans tous les bâtiments où l'on se livre à des travaux exposant au danger du feu, dans ceux où l'on manipule des substances inflammables, il faudra avoir soin de pratiquer un nombre suffisant de fenêtres s'ouvrant facilement et permettant l'entrée et la sortie d'un homme. On établira aussi des escaliers et des échelles à feu, afin que, dans le cas où un incendie éclaterait, le sauvetage des ouvriers puisse s'effectuer facilement. (Voir *Bulletin de la Société de protection des apprentis*, 15e année, t. XIV, p. 101, 1er trimestre 1881.)

Russie. — Voir plus haut, page 361, la prescription d'avoir deux issues pour tout atelier dont la longueur dépasse 15 mètres.

[3] Chez M. Chaix la largeur des passages varie entre 0m,40 et 1 mètre. Le règlement allemand exige 1 mètre, ce qui est une dimension exagérée et difficile à admettre à Paris, étant donnée la valeur très élevée du terrain.

couvre-engrenages, etc.; il prévoit le cas des machines à scier, à fraiser, à raboter, etc.; il demande que la mise en train ou l'arrêt des machines n'ait jamais lieu sans que les ouvriers soient prévenus par un signal; il veut aussi que le maniement des courroies se fasse mécaniquement, que les ouvriers ne soient employés au graissage ou au nettoyage que dans des conditions complètes de sécurité, et qu'enfin les conducteurs de machine aient la faculté de pouvoir immédiatement arrêter la force motrice et les transmissions.

Ce règlement nous semble plus complet et plus simple que le projet allemand que nous reproduisons en note ci-dessous [1].

[1] Allemagne. — *Loi sur les métiers, art. 120*..... Enfin les entrepreneurs industriels sont tenus de prendre et de maintenir toutes les mesures nécessaires, suivant les différentes branches d'industrie, pour garantir, autant que possible, contre tout danger la vie et la santé de leur personnel. Le conseil fédéral peut déterminer les mesures à prendre pour chaque genre d'industrie....

Projet de réglementation tendant à préserver la vie et la santé des ouvriers de fabrique. En vertu du paragraphe 120, alinéa 3, de la *Gewerbeordnung*, sont publiées les prescriptions suivantes :

A. Pour les fabriques qui occupent des ouvriers dans des locaux fermés :

1° Les locaux de travail, y compris les corridors et les escaliers, doivent être bien éclairés, et pourvus de planchers solides et unis.

Les locaux de travail doivent être assez spacieux pour qu'il y ait au moins ..... mètres cubes d'air pour chaque ouvrier qui y est occupé.

2° Les locaux de travail seront disposés de telle manière que l'air ne soit pas vicié par des exhalaisons et vapeurs nuisibles, délétères et irrespirables.

3° Les locaux ou appareils dans lesquels existent ou peuvent se produire des gaz, des vapeurs ou poussières inflammables, délétères et irrespirables, seront disposés de manière que ces matières nuisibles ne puissent pénétrer dans les ateliers.

L'entrée de ces locaux ne pourra être permise que lorsque ces objets nuisibles auront été éloignés, ou que les ouvriers à y occuper seront munis d'appareils de ventilation répondant à ce but, ainsi que, si le cas l'exige, de lampes de sûreté.

4° Les escaliers doivent être munis, au moins d'un côté, de rampes solides. Les marches doivent en être tenues constamment en bon état.

5° Les ouvertures servant à monter et à descendre des marchandises, les entonnoirs d'emplissage et autres appareils à porter et à charger, les échafaudages, greniers, galeries, murailles d'appui, plateformes, plans inclinés, de même que les carreaux, fossés, rigoles et bassins, poêles, chaudières et réservoirs ayant une hauteur de plus de .... mètres et qui contiennent des liquides empoisonnés, corrosifs ou chauds, ou qui servent à chauffer, doivent être si bien conditionnés ou entourés que des hommes ne puissent y tomber ni être atteints par la chute de quelque objet.

6° Il faut disposer et faire manœuvrer les monte-charges (élévateurs, monte-charges avec frein, etc.), de manière que :

a. La voie de la cage du monte-charges et des contrepoids soit fermée;

b. Que la fermeture du puits à l'entrée des galeries se fasse d'elle-même et d'une manière sûre;

c. Que rien ne puisse tomber de la cage du monte-charges et des galeries dans le puits;

Nous ne voulons pas l'analyser plus en détail, la question est de celles qui ne se discutent guère, et la nécessité de protéger le

d. Qu'une entente entre les extrémités des galeries soit assurée par des signaux.

Le transport des hommes en monte-charges ne sera permis que lorsqu'on ne pourra l'éviter par suite de la nature de l'exploitation; dans le cas de ce transport, la charge ne devra pas dépasser le tiers de celle que l'on peut transporter. Le monte-charges doit être, dans ce cas, pourvu de chapeaux, de parachutes ou d'autres appareils préservatifs.

7° Dans tous les bâtiments où l'on se livre à des travaux exposant au danger du feu, dans ceux où l'on manipule des matières inflammables, il faudra avoir soin de pratiquer un nombre suffisant de fenêtres s'ouvrant facilement et permettant l'entrée et la sortie d'un homme. On établira aussi des escaliers et des échelles à feu, afin que, dans le cas où un incendie éclaterait, le sauvetage des ouvriers puisse s'effectuer facilement.

B. Pour les établissements industriels dans lesquels on emploie des machines mues par une force élémentaire :

1° Les machines (à vapeur, à gaz, à air chaud, roues hydrauliques et turbines) devront être installées dans des locaux séparés, ou fermés du côté où l'on travaille, de manière que leur accès soit exclusivement réservé aux ouvriers chargés de s'en servir.

Ne peuvent être chargés de ce soin que des ouvrier sûrs, d'un âge mûr et du sexe masculin. L'accès de ces machines est interdit à toute autre personne.

Les machines, et particulièrement le balancier et la manivelle des machines horizontales, doivent être clôturés et les tiges de piston solidement emboîtées.

2° Toutes les parties de transmission et de machines en mouvement qui sont situées de manière que les hommes par leur travail ou leurs rapports puissent se mettre en contact avec elles, quand elles ne servent pas directement d'outils ou que leur maniement et leur surveillance constante pendant le travail ne sont pas nécessaires, doivent être entourées par des abris préservatifs, afin qu'aucun contact ne puisse avoir lieu.

Il faudra particulièrement :

a. Que les courroies de transmission, lorsqu'elles se trouvent à portée des ouvriers, soient pourvues de solides caisses ou de chéneaux à une hauteur de 1^{m},50 du plancher. On enveloppera de même les arbres de transmission;

b. Que les cordes de transmission soient fixées à telle hauteur qu'elles ne puissent blesser personne;

c. Que les balanciers et poulies placés très bas, et se mouvant à portée des ouvriers, soient enfermés au moins à 1^{m},50 de hauteur au-dessus du plancher;

d. Que les roues d'engrenage soient enfermées;

e. Que toutes parties saillantes (vis d'arrêt, clavette, etc.) aux poulies de transmission et manchons soient coupées ou enfoncées.

3° Le commencement de mouvement des transmissions doit être signalé dans tous les locaux de travail, de manière à être entendu par chaque ouvrier.

4° Dans les établissements où la force motrice employée pour l'ensemble de l'exploitation est divisée en plusieurs étages ou utilisée par plusieurs entrepreneurs, il faudra prendre des dispositions telles que chaque fraction isolée de l'ensemble du mouvemeut puisse être arrêtée promptement et d'une manière certaine.

Autant que le genre d'exploitation le permettra, il faudra aussi pouvoir arrêter les transmissions dans les divers locaux de travail, sans empêcher la marche des autres transmissions, ni celle de la machine à vapeur, et arrêter les dernières machines-outils, sans arrêter les transmissions.

travailleur contre les accidents qui résultent du travail s'impose comme l'évidence. C'est pourquoi la Chambre a fait bon accueil à une pétition de M. Ovièvc, de Darnetal, demandant que les prescriptions ordonnées pour la sécurité des enfants par l'article 14 de la loi du 19 mai 1874 soient étendues aux adultes. La Société industrielle de Rouen, consultée sur cette pétition par M. le Préfet de la Seine-Inférieure, avait déjà conclu favorablement pour la proposition Ovièvc, *tout en réservant sa préférence pour la protection du travail par voie d'initiative privée*, conception plus généreuse que pratique dont nous allons avoir à parler dans un instant.

M. Waddington, dans le projet de loi que nous avons reproduit plus haut, demande aussi, par son article 5, que les dispositions exigées par l'article 14 de la loi du 19 mai 1874 soient applicables à toutes les usines et manufactures sans distinction. MM. Félix Faure et Martin Nadaud voudraient, comme nous l'avons rappelé, qu'un règlement d'administration publique indiquât les

Dans le cas où cela est impossible, il y aura à prendre des dispositions telles que de chaque local de travail on puisse donner le signal d'arrêt du moteur.

Tous les appareils servant à arrêter la force motrice, les transmissions et machines de travail doivent être à portée de la main, facilement maniables et conditionnés de manière à agir vite et sûrement.

5° Les machines-outils avec instruments tranchants tournant avec vitesse (telles que machines à fraiser, à raboter, à racler, à découper, les cisailles, coupe-chiffons et autres engins de même nature) doivent être pourvues de débrayages et, autant que le genre de travail le permet, être disposées de telle sorte que les ouvriers ne puissent, du lieu où ils sont occupés, toucher involontairement ces instruments tranchants, ni être atteints des éclats ou débris lancés.

6° Les corridors se trouvant entre les machines de travail doivent être solides, complètement unis et au moins larges d'un mètre.

Tous les locaux dans lesquels se trouvent des machines ou transmissions devront être, pendant la durée du travail, éclairés par la lumière du jour ou au moyen d'un éclairage artificiel tel que l'on puisse facilement voir toutes les parties en mouvement.

7° On ne doit tolérer le nettoyage, graissage et les réparations des machines ou transmissions pendant qu'elles sont en mouvement, ni la pose d'échelles contre les arbres de transmission, ni la mise de courroies sur des poulies pendant leur mouvement, à moins qu'on ne se serve d'appareils garantissant l'ouvrier contre tout danger.

8° L'accès de tel poste de travail et d'occupation où le contact avec les machines et les parties de transmission est facile, ne doit être permis qu'à ceux des ouvriers qui portent un habillement serrant bien les bras et le corps.

9° Dans chaque local de travail, il faudra appendre, à un endroit que tous les ouvriers puissent voir, un tableau sur lequel on inscrira les prescriptions des paragraphes 7 et 8, en écriture lisible.

Il est permis d'y ajouter des instructions complémentaires qui devront être données aux ouvriers pour les préserver du danger.

Il est également nécessaire de placarder, aux endroits où le danger ne peut être écarté par des appareils préservatifs, des affiches signalant ce danger.

prescriptions particulières aux usines à moteurs mécaniques en tout ce qui concerne les précautions à prendre pour prévenir les accidents.

Pourtant il s'est fait dans ces derniers temps un mouvement contre l'intervention de l'État en matière d'hygiène industrielle et d'accidents de fabrique.

Par une conception singulière de la liberté, certains ingénieurs et industriels, n'envisageant que la contrainte qui résulte pour eux des dispositions réglementaires et la gêne que leur cause l'inspection, demandent que toutes les mesures soient laissées à leur bon vouloir et à leurs excellentes intentions humanitaires. On ne saurait mettre en doute les sentiments qu'ils expriment; mais quand on les voit critiquer vivement les dispositions des lois anglaises, suisses, allemandes, autrichiennes, etc., on peut croire qu'ils n'ont pas une notion suffisamment exacte des nécessités de l'hygiène publique et des droits de l'État pour la protection des citoyens.

L'occasion ou le prétexte de ce mouvement, de cette défiance envers l'Administration, a été la présentation à la Chambre des députés d'un certain nombre de propositions de loi relativement à la responsabilité des accidents dont les ouvriers sont victimes, propositions émanant de M. Martin Nadaud, de M. Peulevey, de M. Félix Faure et de M. Henry Maret[1].

Les propositions de ces honorables députés sont relatives seulement à la responsabilité; elles ne touchent pas directement aux questions d'hygiène, et il est regrettable qu'il se soit établi une confusion entre deux questions si distinctes.

Quoi qu'il en soit, cette confusion a été faite par quelques-uns et utilisée par d'autres.

M. G. Salomon, dans un mémoire à la Société des ingénieurs civils, a demandé *la liberté des mesures contre les accidents de fabrique.* Il espère que les industriels appliqueront spontanément ces mesures, afin de trouver une compagnie d'assurance qui veuille bien courir le risque de contracter avec eux. C'est fort bien pensé; mais c'est

[1] Il n'est pas sans intérêt de signaler ici que l'idée de rendre l'assurance obligatoire par les patrons est actuellement un fait accompli en Allemagne, et qu'une loi du 15 juin 1883 règle les conditions d'assurance des ouvriers contre la maladie. Nous n'avons pas à discuter ici l'opportunité d'une telle loi, mais nous pouvons signaler en passant qu'il y est fait des prescriptions spéciales pour le cas où l'ouvrier est employé à une industrie insalubre : *Art. 61. Les patrons, quand la nature de leur industrie entraîne des risques particuliers de maladies, peuvent être tenus d'ériger une caisse de fabrique, alors même qu'ils occupent moins de cinquante ouvriers.*

malheureusement tout le contraire qui s'observe dans la pratique, et à chaque instant les inspecteurs du travail des enfants, qui recommandent ou qui exigent des mesures de protection, se heurtent à cette réponse : « C'est inutile, je suis assuré. »

Sans doute M. Salomon et tous ceux qui ont écrit dans le même sens[1] invoquent l'exemple de la Société mulhousienne, fondée par M. Engel-Dollfus, et de l'Association rouennaise contre les accidents de fabrique; ils pourront y joindre maintenant l'Association parisienne des industriels contre les accidents du travail. Ces sociétés obligent ceux qui y entrent à prendre les mesures les meilleures de protection et d'assainissement; des inspecteurs nommés par elles les conseillent et les surveillent tout à la fois. Il est certain qu'elles rendent et rendront de très grands services, comme en a rendu l'Association des propriétaires d'appareils à vapeur; elles contribuent par leurs travaux et leurs recherches à rendre plus parfaits les moyens de protection; elles aident efficacement à l'action administrative, et il se peut qu'un jour elles la rendent inutile. Mais ce jour ne semble pas proche.

La Société mulhousienne, la première en date, malgré les efforts généreux de son regretté fondateur, laisse encore en dehors de sa sphère d'action plus de la moitié des industries de la région ; la Société rouennaise n'a pas 50 adhérents dans une région qui comprend plus de 1,000 établissements industriels de premier ordre. La Société parisienne vient seulement de se fonder.

La liberté qu'on invoque pour substituer cette action si restreinte à l'action générale de l'État n'est en réalité qu'au bénéfice de l'industriel, qui demeure libre de prendre ou de ne pas prendre les mesures nécessaires à la protection de l'ouvrier[2].

Pour justifier cette prévention contre l'Administration, on a dit que ses agents ne présentaient pas une compétence suffisante, ou

[1] *Poan de Sapincourt.* — État actuel de la question des accidents du travail (Société industrielle de Rouen).

Talansier. — Les accidents du travail (Communication à l'Association française pour l'avancement des sciences, 1883).

[2] Les Associations de propriétaires d'appareils à vapeur, qui rendent en France de si grands services, ne suppléent pas cependant complètement au service d'inspection de l'État. En effet, il existe actuellement en France 9 associations surveillant environ 8,000 chaudières, c'est-à-dire pas plus de 12 p. o/o des chaudières en activité. — En Angleterre il y a 10 associations surveillant 64,000 chaudières, c'est-à-dire 40 p. o/o du chiffre total.

Ajoutons qu'en Suisse une seule association, celle de Zurich, surveille 1,400 chaudières, c'est-à-dire 70 p. o/o du nombre total d'appareils que possède la Suisse.

des garanties d'honorabilité et de discrétion qu'on se montre prêt à accorder cependant aux agents des associations privées. Cette critique ne mériterait pas de nous arrêter si nous ne trouvions là une occasion de nous expliquer sur les garanties de compétence qu'on devra exiger des fonctionnaires chargés de l'inspection de la salubrité et de la sécurité des ateliers [1].

[1] On feint volontiers de croire dans les discussions sur ce projet qu'il s'agit d'imposer à l'industrie des conditions draconiennes, et l'on cite volontiers, sans la connaître toujours, la loi autrichienne du 17 juin 1883 sur la création d'inspecteurs des fabriques. Nous donnons ici cette loi *in extenso* :

Loi du 17 juin 1883 concernant la création d'inspecteurs des établissements industriels :

Article premier. Le Ministre du commerce est autorisé, après entente avec son collègue de l'intérieur, à nommer des inspecteurs des établissements industriels en nombre suffisant, et un inspecteur central.

Art. 2. Les pouvoirs d'un inspecteur s'étendent sur toutes les entreprises industrielles d'une ou de plusieurs circonscriptions d'un Pays (d'un État), et peuvent toujours être étendus ou diminués par le Ministre du commerce sans dépasser les frontières du Pays.

Les inspecteurs sont subordonnés à l'autorité politique sur le territoire de laquelle s'exerce leur action.

Art. 3. Exceptionnellement le Ministre du commerce peut autoriser un inspecteur à étendre son action sur un pays ou territoire limitrophe de sa circonscription.

Art. 4. Le Ministre du commerce conserve la faculté de retirer aux inspecteurs la surveillance de certaines industries représentées dans leurs circonscriptions, et de l'attribuer à des inspecteurs spéciaux dont les pouvoirs peuvent s'étendre à plusieurs pays.

Art. 5. La tâche des inspecteurs à l'égard des patrons et des ouvriers consiste dans la surveillance de l'exécution des prescriptions légales, concernant :

1° Les dispositions que les patrons sont tenus de prendre dans l'intérêt de la vie et de la sûreté des ouvriers aussi bien dans les locaux destinés au travail que dans les habitations s'il en existe;

2° L'emploi qui est fait des ouvriers, la durée de la journée de travail, et les interruptions de travail périodiques;

3° La tenue des listes d'ouvriers, et l'existence de règlements de service, ainsi que les payements et le renvoi des ouvriers;

4° L'instruction professionnelle des jeunes ouvriers.

Art. 6. L'inspecteur doit remplir le rôle d'un agent technique de surveillance, d'information et de consultation à l'égard des autorités industrielles centrales, en ce qui concerne l'exécution des dispositions législatives concernant l'industrie, et peut aussi être chargé de revêtir de son avis les demandes d'autorisation d'établissements nouveaux, ou de modifications à faire à des autorisations déjà accordées, lorsqu'il se trouve dans ces demandes des circonstances qui peuvent exercer une influence sur la santé et la vie des ouvriers.

Art. 7. Le devoir de l'inspecteur comprend également l'obligation qui lui est imposée de soumettre à une revision continue les établissements attribués à sa surveillance, et d'acquérir ainsi une connaissance exacte des circonstances qui doivent rentrer dans le domaine de ses observations.

Art. 8. L'inspecteur, après avoir fait constater son identité auprès du patron ou de

Disons tout de suite que l'Association parisienne des industriels contre les accidents du travail a fourni, pour l'admission des can-

son représentant par la présentation d'une carte délivrée par le chef de l'État, et renouvelée tous les ans, entre de droit dans tous les locaux destinés au travail ou à l'habitation dans toutes les industries soumises à sa surveillance; de nuit, ce droit est restreint aux moments de travail. Le patron ou son représentant sont en droit de l'accompagner dans son inspection.

L'inspecteur a le droit d'interroger, même sans témoins s'il est nécessaire, toute personne attachée à l'exploitation industrielle, même le patron ou ses représentants, partout où s'exécutent les travaux relatifs à l'industrie, sur toutes les circonstances qui rentrent dans la sphère de son activité, en évitant toutefois, autant que faire se peut, tout trouble de l'exploitation.

Les patrons ou leurs représentants sont obligés de présenter à l'inspecteur, sur sa demande, les autorisations relatives à la création de leurs établissements avec les plans et dessins qui y sont annexés.

Lorsque l'une des personnes désignées plus haut refuse à l'inspecteur l'entrée des locaux à inspecter, se refuse à répondre aux questions, ou empêche quelque autre de répondre à ses questions, fait des réponses fausses ou engage d'autres à les faire, enfin, lorsque le patron ou son représentant refuse de produire les autorisations et plans y annexés; cette personne, si l'ensemble des faits ne constitue pas un acte tombant sous le coup des lois pénales ordinaires, se rend coupable d'une contravention, et devient justiciable de l'autorité chargée de la surveillance de l'industrie.

Art. 9. Si l'inspecteur constate que, dans une entreprise industrielle, les dispositions dont il doit vérifier l'existence ne sont pas convenablement prises, il doit exiger du patron la suppression immédiate de ces inconvénients ou de cet état contraire aux lois et, dans le cas de refus, adresser un rapport à l'autorité industrielle compétente, en introduisant ainsi la procédure régulière.

Art. 10. Les autorités industrielles doivent renvoyer à l'inspecteur leur décision sur les réclamations qu'il leur a adressées en vertu de l'article 9 aussitôt qu'elles sont prises, et il est loisible à cet inspecteur d'en appeler des décisions de la 1re et de la 2e instance dans les délais réglementaires.

Art. 11. Sur la demande de l'inspecteur, la juridiction industrielle peut, si la santé des ouvriers lui semble mise en danger par la nature de leur travail ou les procédés employés dans l'établissement, désigner, pour faire les recherches nécessaires, des médecins, des chimistes et autres experts dont la rétribution pèse sur le patron si l'existence des défectuosités indiquées par l'inspecteur est constatée.

Art. 12. Dans l'exécution de leur mandat, les inspecteurs doivent avoir à cœur, par leur contrôle actif et bienveillant, non seulement d'assurer les bienfaits de la loi à la population ouvrière, mais aussi de prêter un discret appui aux patrons pour leur faciliter l'exécution des exigences de la loi. Ils doivent encore s'efforcer de servir d'intermédiaires impartiaux entre les patrons et les ouvriers, en s'appuyant sur leurs connaissances techniques et leur expérience administrative, et d'obtenir une sorte de situation de confiance aussi bien vis-à-vis des patrons qu'à l'égard des ouvriers, qui leur permettra de contribuer à assurer la justice et à conserver de bonnes relations réciproques entre patrons et ouvriers.

Art. 13. Les inspecteurs doivent adresser annuellement des rapports circonstanciés, sur leurs travaux et leurs observations, au Ministre du commerce par la voie des autorités du pays; ces rapports devront mentionner avec détails les accidents dont les ouvriers ont pu être victimes et leurs causes, ainsi que des propositions éventuelles relatives à des mesures législatives et administratives pouvant être prises dans l'intérêt de l'industrie et des ouvriers.

didats au poste d'inspecteur de l'Association, un programme digne d'intérêt, dont nous reproduisons ici les points principaux :

Le corps d'inspecteurs de l'Association devra réunir un ensemble de connaissances variées embrassant, autant que possible, toutes les branches de l'art de l'ingénieur et de la science de l'hygiène en matière de risques et d'accidents, mesures préventives et mesures réparatrices. Comme un seul homme réunirait difficilement en sa personne toutes ces notions multiples, les inspecteurs devront nécessairement se spécialiser. Par la réunion d'un certain nombre de spécialistes, on formera un faisceau compact, représentant les diverses classes industrielles, qui sera en mesure de répondre aux exigences multiples et si diverses de l'industrie française.

Cependant, s'il est difficile de trouver réunies en un seul inspecteur toutes les connaissances nécessaires pour répondre à la grande pensée qui dirige l'Association, il n'en est pas moins vrai qu'il est un certain ensemble de connaissances générales que l'on devra rencontrer chez tous les candidats.

Si nous cherchons à déterminer quel sera le niveau d'instruction générale qui permettra aux adhérents d'avoir confiance dans leurs inspecteurs et à ceux-ci de remplir la tâche très complexe qui leur incombe, il semble que l'on doive

Ces rapports seront annuellement soumis au Reichsrath dans un travail d'ensemble.

Art. 14. Les inspecteurs sont, pendant la durée de leurs fonctions, assimilés aux fonctionnaires de l'État, et soumis en cette qualité aux règlements généraux du service.

Art. 15. Ne peuvent être nommés inspecteurs que les candidats pourvus du degré nécessaire de connaissances techniques et connaissant les diverses langues employées dans leur ressort.

Art. 16. Les inspecteurs sont tenus, par leur serment professionnel, à garder le secret sur les conditions commerciales et industrielles parvenues à leur connaissance; ils doivent notamment observer la plus sévère discrétion relativement aux organisations techniques, procédés et autres particularités de l'exploitation qui leur sont désignés par les patrons comme ne devant pas être livrés à la publicité.

Ceux qui, pendant la durée de leur emploi ou après sa cessation, communiqueraient sans autorisation ou publieraient de semblables détails, ou utiliseraient à leur profit la connaissance qu'ils pourraient en avoir, se rendraient coupables d'un délit puni de trois mois à deux ans de prison, à moins qu'il n'y ait lieu de leur appliquer des dispositions plus sévères de la législation pénale commune. L'application de peines disciplinaires n'est pas exclue par cette disposition.

Art. 17. Il est interdit aux inspecteurs d'entreprendre, ni pour eux-mêmes ni pour d'autres, des exploitations industrielles telles que fabriques ou ateliers, non plus que de prendre un intérêt quelconque dans de semblables entreprises, ou d'y être employés comme ouvrier, mécanicien, chef d'équipe, ingénieur, etc.

Art. 18. Les inspecteurs ne doivent accepter aucune sorte de gratification pour les actes de leurs fonctions, ni des patrons, ni des ouvriers, dont ils ne doivent jamais devenir les hôtes.

Art. 19. Les inspecteurs ne doivent, en dehors de leurs fonctions ordinaires, être chargés d'aucuns travaux qui y seraient étrangers, et particulièrement ne jamais être soumis à des instructions de l'administration financière. Ils n'ont point le droit de prendre connaissance des livres de commerce, bilans, correspondances, etc., des patrons.

trouver ce niveau chez les ingénieurs, architectes, hygiénistes et chez d'anciens industriels.

C'est là, en effet, que se trouvent réunies, de la manière la plus générale, les connaissances variées et approfondies que nous devons rechercher chez nos inspecteurs.

En ce qui concerne les arts mécaniques, ils devront être au courant de tout ce qui a été fait jusqu'alors pour éviter les accidents de machines, être à même de renseigner sur ce point les industriels, connaître les prix des appareils de sûreté et pouvoir en diriger l'installation.

Dans les arts chimiques, nos inspecteurs devront pouvoir résoudre toutes les questions qui ont trait aux intoxications par respiration de poussières dangereuses ou de gaz délétères; ils devront connaître les procédés à employer pour assainir l'atelier ou supprimer les causes d'insalubrité, les perfectionnements réalisés dans cette voie et les précautions à prendre pour éviter les accidents.

En ce qui concerne la construction, les mêmes notions pratiques, la même connaissance approfondie de la matière seront indispensables.

Là ne se borneront pas leurs études. Ils devront être au courant de la jurisprudence générale concernant les accidents de fabriques, des règlements sur le travail des femmes et des enfants employés dans les manufactures, de la législation des établissements dangereux, insalubres ou incommodes.

Ils réuniront les principaux règlements des usines et s'en inspireront pour propager ceux que l'expérience leur indiquera comme les meilleurs.

Enfin, ils devront être à même, dans les cas d'accidents, de formuler des prescriptions immédiates sur les mesures à prendre et les soins à donner en attendant l'arrivée du médecin.

Les questions d'hygiène générale des individus, des usines et des villes ne leur seront pas non plus étrangères, et ils connaîtront tout ce qui concerne les assurances contre les accidents et les incendies.

Ce programme est sans doute un peu vague, mais on y peut puiser des idées très justes, et notamment en ce qui touche à la spécialisation des inspecteurs. On ne saurait exiger, en effet, des connaissances encyclopédiques de ces fonctionnaires, et il est certain qu'il serait favorable à un service d'inspection bien fait, d'avoir à sa disposition des compétences multiples et diverses, qu'on pourrait associer pour une enquête sérieuse et dans les cas litigieux.

C'est dans cet ordre d'idées que la commission a examiné les conditions de recrutement du personnel de l'inspection. La diversité des compétences est assurée par la multiplicité des origines des candidats qui peuvent être des ingénieurs diplômés de l'État, des ingénieurs de l'École centrale, des conducteurs des ponts et chaussées, des gardes-mines, des élèves médaillés des écoles d'arts et métiers, des docteurs en médecine, des licenciés ès sciences physiques et chimiques, des élèves diplômés de l'École des hautes

études commerciales, des pharmaciens de 1re classe. Tous ces candidats seraient d'ailleurs soumis à une épreuve d'admissibilité qui les obligerait à montrer des connaissances hygiéniques suffisantes, épreuve d'autant plus nécessaire que si l'enseignement de l'hygiène n'a pas encore dans les Facultés de médecine tout le développement qui serait nécessaire, cet enseignement n'existe pas dans les autres Écoles de l'État, ni à l'École polytechnique, ni à l'École centrale, ni à l'École des hautes études commerciales.

Il n'était pas possible de faire entrer dans un règlement les détails du programme sur lesquels devra porter l'examen d'admissibilité. On consultera avec intérêt, quand il s'agira de définir cette épreuve, le document que nous citions tout à l'heure, en l'empruntant à la Société parisienne contre les accidents des fabriques et ateliers.

On pourra s'inspirer aussi, dans la rédaction d'un programme, des questions qui sont posées en Angleterre aux candidats pour l'examen de médecine publique (*State medicine*) [1].

Il ne paraîtra pas exagéré de dire, qu'en tous cas, ce programme, portant à la fois sur les questions d'hygiène générale, d'hygiène professionnelle, de technologie, de législation, pourrait être ainsi caractérisé sommairement :

1° *Hygiène générale.* — Aération, ventilation, encombrement, chauffage, éclairage. — Analyse de l'air et des eaux, etc.

2° *Hygiène professionnelle.* — Maladies et accidents causés par le travail. — Intoxications professionnelles. — Déformations dues à l'attitude. — Analyse qualitative d'une substance soupçonnée de contenir du plomb, de l'arsenic, du mercure, etc.

3° *Technologie.* — Notions sur les divers appareils proposés ou employés pour l'assainissement du travail et pour la protection des mécanismes.

4° *Législation.* — Lois, décrets, ordonnances, circulaires, relatives à l'hygiène industrielle. — Devoirs et droits des inspecteurs, secret professionnel. — Rapports avec les préfectures, les parquets, les conseils d'hygiène, etc.

On peut affirmer qu'avec un tel programme, les ingénieurs, les médecins, les chimistes, les hygiénistes, qui aborderaient l'examen, feraient des fonctionnaires qui seraient capables non seulement de servir utilement la cause de l'hygiène et de veiller à

[1] Voir *Revue d'hygiène,* 1883, p. 1034 et 1884, p. 288.

l'application des lois, mais encore de fournir au Ministère du commerce, sur l'état de l'industrie nationale, des renseignements suffisamment précis et éminemment utiles.

III

Il n'est pas possible qu'en réglant par une loi les conditions de salubrité et de sécurité des ateliers, on fasse complète abstraction de l'âge et du sexe du personnel qu'on y emploie. Ce sont des facteurs importants du problème de l'assainissement du travail. Il y a plus, c'est que les questions d'hygiène qui touchent à la santé de l'enfant, de la jeune fille, de la femme, employés dans les ateliers, sont liées à l'avenir même de l'industrie et aux conditions les plus impérieuses de la prospérité et de la force nationale, puisqu'elles assurent le recrutement des travailleurs et qu'elles tendent à donner à la patrie de plus nombreux et de plus robustes citoyens pour l'enrichir, pour la défendre et la faire respecter.

Et qu'on ne croie pas que ce soient là des conceptions d'ordre purement sentimental; qu'on veuille bien se rappeler, au contraire, qu'en Allemagne, la première disposition législative protectrice du travail des enfants fut prise sur les instances d'un officier de recrutement qui avait signalé le faible contingent fourni par les districts manufacturiers où de nombreux enfants travaillaient aux fabriques. C'était, à bien prendre, une loi militaire. Sans y insister davantage, c'est un point qu'il faut savoir considérer.

Au courant de ce rapport, nous avons, eu à parler de la loi du 19 mai 1874, qui, chez nous, règle actuellement le travail des enfants et des filles mineures. Nous ne voulons en aucune manière empiéter sur les attributions de la Commission supérieure que cette loi a instituée et qui poursuit avec tant de zèle l'étude des modifications et des perfectionnements que l'expérience oblige d'y apporter. Mais il nous semble que quand il s'agit de dangers spéciaux qui résultent pour les travailleurs des considérations d'âge et de sexe, quand il s'agit aussi des faits de *prématuration* et de surmenage déterminés par un travail commencé trop jeune ou d'une excessive durée journalière, il est légitime de voir le Comité consultatif prétendre donner son avis dans ces questions de physiologie et d'hygiène; et nous estimons qu'il serait même désirable qu'un accord se fît entre ce Comité et la Commission supérieure du travail des enfants, préalablement à toute modifi-

cation de la législation. Cette prétention ne vise d'autre but que celui de la protection la plus efficace et la plus sage du travailleur; c'est-à-dire qu'il ne saurait y avoir de conflit, et que l'accord est fait d'avance.

C'est, en tous cas, l'avis de la 3e commission que nous allons brièvement résumer ici sur les questions relatives à l'âge, au sexe et à la durée du travail.

Relativement à l'âge, la loi actuelle exige que les enfants aient 12 ans révolus pour pouvoir être occupés à un travail industriel, mais elle autorise cependant leur emploi à partir de 10 ans dans quatorze industries importantes et dont quelques-unes, comme la filature et la verrerie, présentent de réels dangers pour la santé. On ne peut s'empêcher de regretter, au nom de l'hygiène, qu'on ait, par une exception aussi large, soustrait tant d'enfants à la loi et diminué à leur détriment l'âge d'admission fixé à 12 ans et que les hygiénistes trouvent déjà trop bas dans tous les pays européens.

Peut-on objecter sérieusement l'intérêt de l'apprentissage? Ce serait un argument fait pour nous toucher; mais il est de nulle valeur si l'on considère les industries visées par la réglementation exceptive. Si, en effet, on a pu avec quelque apparence de raison invoquer un tel argument pour les verreries (et nous avons la certitude qu'on a beaucoup exagéré), est-il possible de faire croire que la filature, que le retordage du coton, que la corderie à la fendue et le dévidage des cocons, soient des industries qui nécessitent un apprentissage commencé si jeune? Nous ne saurions l'admettre; il est très certain que la loi perd toute autorité dans cette extension irrationnelle d'exceptions injustifiées. D'ailleurs, il faut bien convenir que dans beaucoup d'industries, et dans beaucoup d'ateliers des grandes villes surtout, on fait de moins en moins des apprentis. Les causes de ce délaissement sont multiples; d'une part, les parents, souvent imprévoyants, n'envisagent que le résultat immédiat et préfèrent engager leurs enfants comme petits ouvriers dans les professions qui les recherchent et qui payent tout de suite les *petites mains;* d'autre part, l'élévation du prix des loyers et des denrées alimentaires empêche les petits patrons de se charger du logement et de la nourriture de l'enfant, comme ils faisaient autrefois. L'apprentissage se meurt en France, et c'est à juste raison qu'on attache tant de prix à la création et au développement d'écoles professionnelles destinées à le remplacer. Il en résulte

aussi qu'on élèvera sans inconvénient l'âge où l'enfant peut être admis dans l'atelier.

C'est ce qu'a bien compris et exprimé M. le Ministre du commerce quand, dans la lettre qu'il adressait le 14 mars dernier à MM. les membres de la Commission supérieure du travail des enfants, il fait remarquer que cette tolérance, accordée à certaines industries, d'employer les enfants à partir de 10 ans a été l'objet de critiques unanimes et réitérées de la part des inspecteurs divisionnaires ; et c'est justement qu'il ajoute: «Plus on retardera la «limite d'âge, plus on aidera au développement physique de l'en-«fant; plus il sera apte à supporter les fatigues de la vie labo-«rieuse qui l'attend, fatigues auxquelles il pourra moins résister «s'il a épuisé ses forces par un labeur prématuré.»

Toutefois il est nécessaire de fixer un âge. Les lois étrangères varient dans cette fixation. La loi projetée en Italie fixe 9 ans; les lois anglaise, danoise, espagnole, 10 ans; la loi autrichienne, la loi hollandaise, la loi suédoise, 12 ans; la Suisse exige 14 ans au moins. Mais presque toutes les lois, même celles qui fixent à dix ans l'admission au travail des ateliers, fixent en même temps à 5 ou 6 heures seulement la durée journalière de ce travail jusqu'à l'âge de 14 ans, et ne permettent qu'à ce moment l'emploi de l'enfant pendant la journée tout entière. Quatorze ans seraient en somme, dans notre pays et en tenant compte du développement moyen des enfants de notre race, un âge désirable pour l'admission au travail des ateliers. Faut-il pourtant aller jusque-là? Ne faudrait-il pas alors tenir compte du sexe de l'enfant et relever encore cet âge chez la jeune fille, comme nous aurons à le dire tout à l'heure? Faut-il au contraire, renonçant à atteindre dans le présent un idéal hygiénique, se préoccuper d'un accord possible entre les lois applicables à l'enfance, et chercher à concilier, par exemple, la loi du 28 mars 1882 avec la loi du 19 mai 1874? C'est de ce côté que nous inclinons. La loi du 28 mars 1882 a rendu l'instruction obligatoire jusqu'à 13 ans; c'est un âge admissible pour commencer le travail industriel dans tous les cas possibles, quand on aura surtout exigé l'assainissement de l'atelier et la sécurité pour le travailleur.

Nous pensons aussi qu'il est utile de maintenir pour les enfants, jusqu'à 16 ou 18 ans, l'interdiction du travail de nuit, et que cette interdiction doit s'appliquer non seulement aux filles mineures, mais aux femmes de tout âge.

Cela nous conduit à dire quelques mots de la femme, au point de vue de sa présence à l'atelier et de sa participation au travail industriel.

Parmi les dépositions faites à la commission parlementaire chargée de l'enquête sur la récente crise industrielle, se trouve un remarquable mémoire de M. le docteur Dubuisson, où cette question du travail des femmes est traitée dans les termes suivants :

« Tous ceux qui ont réfléchi sur la fonction de la femme conviennent que sa place est dans la famille, au foyer, auprès des enfants, et non à l'usine; son vrai rôle est celui de ménagère et d'éducatrice; elle est le centre moral de la famille. Dans tout ce qui la concerne, elle n'est jamais seule en cause, c'est toute la famille qui est en cause avec elle. Il n'y a donc rien que de juste à lui assurer le minimum des conditions qui lui sont nécessaires pour remplir les plus importantes de ses fonctions. Et dans ce but, notre premier souci doit être d'arracher peu à peu la femme à l'usine. Ce serait folie que de vouloir lui interdire tout de suite la porte des ateliers : les conditions économiques ne le supporteraient pas. Mais il est au moins une chose que nous pouvons et que nous devons obtenir : c'est *l'interdiction pour la femme de tout travail de nuit.* Les raisons de santé et de moralité qui militent en faveur d'une pareille réforme sont si graves et si évidentes qu'il est superflu de les indiquer. »

Il n'y a rien à ajouter à cette vue philosophique du rôle de la femme, et l'interdiction pour elle de tont travail de nuit est un desideratum que tous les hygiénistes voudraient voir comblé.

On pourrait même se demander, comme nous l'indiquions tout à l'heure, s'il ne conviendrait pas d'exiger pour la petite fille un âge d'admission au travail industriel plus élevé que pour le petit garçon. Il n'y a qu'une loi en Europe qui ait fait cette distinction, c'est la loi espagnole. Faudrait-il introduire une telle disposition dans la loi française ?

Sans doute si l'on considère que c'est une époque difficile que celle de la puberté pour les filles, et que le surmenage physique et l'excitation morale qui résultent du travail à l'atelier ne sont guère favorables à l'établissement normal et régulier de la fonction menstruelle, on est tenté de croire qu'il y aurait avantage à ne permettre aux enfants du sexe féminin l'entrée des ateliers et manufactures qu'après 15 ans.

Il résulte en effet des recherches de M. G. Lagneau, que les premières menstrues se manifestent chez les filles à 14 ans 1 mois 13 jours (chiffre moyen) dans les départements méditerranéens; à 14 ans 11 mois 13 jours dans le Centre, l'Ouest et le Nord-Ouest; à 15 ans 8 mois 28 jours dans le Nord et le Nord-Est.

Mais, si l'on accepte comme un mal nécessaire la coopération de la femme dans le travail industriel, il est difficile de régler assez minutieusement, pour que ce soit une mesure utile, la date de son entrée à l'atelier. Il faudrait, pour se montrer juste et logique, pousser les choses jusqu'aux limites du ridicule et, ajoutons-le, de l'inconvenance : tenir compte de la région qu'habite la jeune fille, peut-être même de dispositions individuelles, de différences de tempérament et de constitution qui échappent à toute réglementation. Et c'est pourquoi il est plus simple et convenant d'adopter, pour limite d'âge inférieure, 13 ans chez les filles comme chez les garçons, en attendant que l'avenir amène petit à petit cette réforme plus radicale et plus souhaitable au point de vue de l'hygiène physique et morale : de laisser la femme à la maison et de lui fermer la porte de l'atelier.

Ce que dès maintenant les hygiénistes pourraient désirer de voir ajouter à la législation relativement au travail des femmes, ce serait une disposition qui les éloignerait des fatigues et des dangers du travail dans le temps qui précède et dans le temps qui suit leurs couches. Quelque difficulté qu'on puisse rencontrer à appliquer une telle disposition réglementaire il ne faudrait pas, ce nous semble, hésiter à l'inscrire comme un principe utile. C'est la fonction sublime de la femme d'être mère; il faut donc protéger la maternité. Ajoutons que c'est une chose bien inconséquente que de protéger les enfants à l'école ou à l'atelier et que de risquer d'en laisser un si grand nombre mourir faute de soins aux premiers jours de la naissance.

On n'a pas hésité, en divers pays de l'étranger, à inscrire dans la loi cette protection de la maternité[1]. C'est un bon exemple à suivre.

Une question très discutée, c'est celle de la réglementation des

[1] Allemagne. — *Loi sur les métiers, art. 135*..... Il est défendu de faire travailler les femmes accouchées pendant les trois semaines qui suivent l'accouchement.

Italie. — Le projet de loi, qui date de 1880, sur le travail des enfants et des femmes dit à l'article 8, § 2 : «... Elles ne peuvent être employées dans les fabriques et autres établissements industriels dans les deux semaines qui suivent l'accouchement.»

Autriche. — *Loi sur le travail des enfants, 1869, art. 31.* Les ouvrières ne peuvent être employées dans les fabriques six semaines avant et après leurs couches.

Suisse. — *Loi fédérale, 23 mars 1877, art. 15, § 2*..... Après et avant leurs couches, il est réservé un espace de temps de huit semaines en tout, pendant lequel les femmes ne peuvent être admises au travail dans les fabriques. Elles ne sont reçues de nouveau dans la fabrique qu'après qu'elles ont fourni la preuve qu'il s'est écoulé six semaines au moins depuis le moment de leurs couches.

heures de travail. Pour les enfants, pour les jeunes filles, pour les femmes, on tombe d'accord qu'il est utile et légitime à la fois de réglementer cette durée du travail journalier; les arguments qu'on invoque pour cela sont trop connus pour que nous songions à les reproduire. Mais quand il s'agit des hommes, l'accord cesse immédiatement.

Sans doute on peut dire qu'au point de vue de l'hygiène théorique, la diminution de la durée du travail serait une mesure désirable; et il paraîtrait logique, si l'on réformait sur ce point la législation actuelle, de baser la réglementation nouvelle sur dix heures par jour et six jours par semaine, comme le demande M. Waddington, ou à tout le moins sur onze heures, comme on a fait en Suisse[1].

Mais nous ne pouvons ignorer qu'on peut alléguer justement que si l'intervention de l'État entre le patron et l'ouvrier est justifiée en matière de salubrité et de sécurité, les questions de salaire ne sauraient être étroitement réglementées, et que ces questions sont inhérentes à celle de la durée du travail; on peut ajouter que quand l'État a protégé l'enfant jusqu'à sa virilité, quand il lui a assuré l'instruction, quand il a veillé sur ses premières années de travail à l'atelier, qu'il a pris soin que sa croissance ne soit pas entravée, que sa santé ne soit pas compromise par l'excès de fatigue, par les attitudes déformantes, par tous les dangers et par tous les poisons de l'industrie, il ne doit plus rien à l'homme fait que la liberté. On peut dire encore que l'association, quand l'ouvrier français aura appris à la pratiquer, sera le meilleur et le plus sûr remède à ce travail exagéré. Enfin, on peut se préoccuper de savoir si une telle réglementation est strictement applicable, si ce ne serait pas donner à la loi un caractère à la fois excessif, et tout à fait platonique.

C'est pourquoi nous n'insistons pas sur ces points délicats, ne voulant pas nous écarter de la ligne qui nous a été tracée. Il y au-

[1] SUISSE. — *Loi fédérale 23 mars 1877, art. 11.* La durée du travail régulier d'une journée ne doit pas excéder onze heures. Elle est réduite à dix heures la veille du dimanche et des jours fériés. Cette durée du travail doit être comprise entre 5 heures du matin et 8 heures du soir pendant les mois de juin, juillet et août; et entre 6 heures du matin et 8 heures du soir pendant le reste de l'année.

Lorsqu'il s'agit d'industries insalubres, ou bien lorsque les conditions d'exploitation ou les procédés employés sont de nature à rendre un travail de onze heures préjudiciable à la santé ou à la vie des ouvriers, la durée normale du travail quotidien sera réduite par le conseil fédéral, selon les besoins......

rait d'ailleurs tant à dire qu'il faudrait donner une extension trop grande à ce rapport très étendu [1].

Nous devions cependant faire état de ces questions; tenir compte de la faiblesse ou de l'infériorité qui dépendent du sexe et de l'âge; car ce sont des conditions qui rendent plus impérieusement nécessaire une réglementation assurant la salubrité et la sécurité du travail.

PROJET DE LOI SUR LA PROTECTION DU TRAVAIL INDUSTRIEL.

I. — Dispositions générales.

Article premier. Les établissements industriels, manufactures, fabriques, usines, mines, chantiers et ateliers de tous genres, autres que l'atelier de famille où aucun ouvrier étranger n'est employé, sont assujettis, sous le contrôle de l'Administration supérieure, à toutes les précautions nécessaires pour que le travail s'y effectue dans les meilleures conditions possibles de salubrité et de sécurité.

Ces établissements devront être constamment tenus dans un état satisfaisant de propreté, d'éclairage et d'aération.

Les machines, mécanismes, appareils de transmission, outils et engins de toutes sortes devront être installés et entretenus de manière à ne présenter aucun danger pour les travailleurs.

Des règlements d'administration publique détermineront : 1° dans les trois mois de la promulgation de la présente loi, les dispositions communes auxquelles doivent se conformer indistinctement les chefs d'établissements de toute nature; 2° au fur et à mesure des nécessités constatées, les prescriptions particulières relatives soit à certaines industries, soit à certains modes de travail.

Art. 2. Un corps spécial d'inspecteurs du travail industriel, placé sous l'autorité du Ministre du commerce, sera chargé de

[1] En regard d'un questionnaire envoyé par le Ministère du commerce aux inspecteurs du travail des enfants, les inspecteurs départementaux de la Seine ont accepté généralement la limite actuelle de douze heures de travail (8 ont indiqué douze heures, 3 ont répondu qu'ils accepteraient plutôt dix heures, 2 se sont prononcés pour onze heures). Ces divergences, d'ailleurs, sont seulement apparentes; ceux qui concluent à une durée de dix heures de travail de l'ouvrier acceptent une présence de douze heures à l'atelier en comprenant les repos.

veiller à l'application des règlements rendus en exécution de la présente loi.

Le premier règlement d'administration publique à intervenir, aux termes de l'article précédent, déterminera le nombre, le traitement, les attributions et le mode de recrutement de ces agents.

Art. 3. Le Comité consultatif d'hygiène publique de France établi au Ministère du commerce présidera, sous l'autorité du Ministre, avec le concours du Comité consultatif des arts et manufactures établi au même département, et dans des conditions qui seront déterminées par le même règlement d'administration publique, à l'uniformité de l'application de la présente loi et des règlements y relatifs.

II. — Pénalités.

Art. 4. Les chefs, directeurs, gérants ou patrons des établissements énoncés à l'article 1er, qui auront contrevenu aux dispositions des règlements d'administration publique, rendus en exécution de la présente loi, seront poursuivis correctionnellement et punis d'une amende de 16 à 50 francs.

L'amende sera appliquée autant de fois qu'il y aura de contraventions distinctes, même constatées au même procès-verbal, sans que le chiffre total puisse, pour une même constatation, dépasser 500 francs.

Art. 5. En cas de récidive, le minimum de l'amende sera de 50 francs et le maximum de 200 francs, sans que le chiffre total pour une même constatation puisse excéder 1,000 francs.

Il y a récidive lorsque le contrevenant a été frappé, dans les douze mois précédant la poursuite, d'une première condamnation pour infraction à la loi ou aux règlements y relatifs.

Le juge peut, dans ce cas, ordonner l'affichage et, s'il y a lieu, l'insertion du jugement dans un ou plusieurs journaux du département, le tout aux frais du contrevenant.

Art. 6. Seront punis d'une amende de 16 à 100 francs, et, en cas de récidive, de 200 à 1,000 francs, les chefs, directeurs, gérants ou patrons qui auront mis obstacle à l'accomplissement des devoirs d'un inspecteur ou de toute personne dûment déléguée pour une visite ou une constatation sur les lieux.

Art. 7. Les chefs d'industrie sont civilement responsables des condamnations prononcées contre leurs directeurs ou gérants.

Art. 8. L'article 463 du Code pénal est applicable aux condamnations prononcées en vertu de la présente loi.

III. — Dispositions transitoires.

Art. 9. Dans le cours des trois premières années de l'application de la présente loi, des sursis pourront être accordés par le Ministre du commerce, le Comité consultatif d'hygiène publique de France entendu, aux industriels qui justifieraient de la nécessité de faire subir des modifications notables à leurs établissements actuels pour que la complète exécution de la loi y pût être assurée.

La durée de ces sursis, d'ailleurs renouvelables, ne pourra dépasser une année.

Le règlement d'administration publique à intervenir aux termes de l'article 1er déterminera les autres mesures transitoires qu'il pourrait être nécessaire d'admettre pour faciliter l'application de la loi.

Projet de règlement d'administration publique à intervenir en exécution des articles 2 et 3 de la loi (projetée) sur la protection du travail industriel.

TITRE Ier. De l'inspection du travail industriel. — § Ier. Composition.

Article premier. Il est créé, en exécution de l'article 2 de la loi du , sur la protection du travail industriel, circonscriptions d'inspection dont les limites et le chef-lieu sont fixés par le tableau annexé au présent règlement.

Les titulaires de ces emplois portent le titre d'inspecteurs du travail industriel. Ils sont nommés par le Ministre du commerce et résident au chef-lieu de leur circonscription.

Des inspecteurs adjoints, en nombre suffisant pour les besoins du service, peuvent être attachés à chaque circonscription. Le Ministre détermine leur résidence d'après ces besoins.

Art. 2. Les inspecteurs adjoints sont choisis exclusivement parmi les candidats français, jouissant de leurs droits, âgés de 25 ans au moins et de 35 ans au plus et déclarés admissibles à la suite d'épreuves dont les conditions seront fixées par arrêté du Ministre du commerce, et qui auront préalablement justifié d'un

des titres suivants : ingénieurs diplômés de l'État, ingénieurs de l'École centrale des arts et manufactures, conducteurs des ponts et chaussées, gardes-mines, élèves médaillés des écoles d'arts et métiers, élèves diplômés de l'École des hautes études commerciales et de l'Institut agronomique, docteurs en médecine, licenciés ès sciences physiques, pharmaciens de 1re classe.

Art. 3. Les inspecteurs sont choisis exclusivement parmi les inspecteurs adjoints, ayant au moins trois ans de service dans cette fonction.

Par disposition transitoire, le premier recrutement du corps d'inspection aura lieu, même pour les inspecteurs, conformément à l'article précédent.

Art. 4. Lorsqu'il y a lieu à remplir un emploi d'inspecteur ou d'inspecteur adjoint, le Comité consultatif d'hygiène publique de France est appelé à en délibérer.

Il dresse, par emploi vacant, une liste de trois noms sur lesquels s'exerce le choix du Ministre.

Art. 5. Les inspecteurs du travail industriel sont répartis en trois classes :

Le traitement de la première classe est fixé à 10,000 francs par an;

Celui de la seconde classe, à 8,000 francs par an;

Celui de la troisième classe, à 6,000 francs par an.

Le traitement des inspecteurs adjoints est fixé à 4,000 francs par an, et lorsqu'un inspecteur adjoint sera, par suite de circonstances exceptionnelles, appelé à remplir, à titre permanent, les fonctions d'inspecteur, il jouira du traitement de la troisième classe.

Art. 6. Les inspecteurs adjoints nommés aux fonctions d'inspecteur prennent rang dans la dernière classe.

Les inspecteurs ne peuvent être promus à une classe supérieure qu'après trois ans au moins passés dans celle à laquelle ils appartiennent.

Art. 7. Les inspecteurs prêtent serment devant le président du tribunal civil et s'engagent à observer la plus sévère discrétion relativement aux procédés techniques spéciaux et aux autres particularités de fabrication qui peuvent être considérés comme la propriété de l'industriel.

Art. 8. Le Ministre fixe, par arrêté, le tarif des frais de dépla-

cement qui peuvent être alloués, selon le cas, soit aux inspecteurs, soit aux adjoints.

§ 2. Attributions.

Art. 9. Les inspecteurs, titulaires ou adjoints, ont entrée dans tous les établissemants sur lesquels la surveillance de l'administration s'exerce aux termes de la loi du .

Ils y vérifient les conditions du travail et constatent, s'il y a lieu, par des procès-verbaux qui font foi jusqu'à preuve contraire, et ce, concurremment avec les officiers de police judiciaire de droit commun, et, pour les exploitations souterraines, concurremment avec les gardes-mines, les infractions à la loi du et aux règlements d'administration publique rendus pour son exécution.

Ils dressent lesdits procès-verbaux en double exemplaire, qu'ils adressent l'un au préfet du département, l'autre au parquet. Ils en font, en outre, rapport immédiat au Ministre.

Toutefois, lorsque l'inspecteur a des doutes sur les causes d'insalubrité ou d'insécurité qu'il constate dans un établissement soumis à son contrôle, il doit, avant de donner suite à son procès-verbal, provoquer l'avis du Conseil d'hygiène de la circonscription, lequel, sur l'invitation du préfet, déléguera tel ou tel expert, ou tel ou tel de ses membres, pour procéder sur les lieux à une vérification contradictoire, et pour l'avis dudit Conseil être annexé au procès-verbal.

Les pièces, dans ce cas, sont transmises au département du commerce, qui statue, au préalable, sur l'opportunité de la poursuite.

Art. 10. Les inspecteurs font rapport, tous les trois mois, au Ministre du commerce, des conditions d'application de la loi dans leurs circonscriptions respectives. Ces rappports sont, par les soins de la direction compétente, communiqués au Comité consultatif d'hygiène.

TITRE II. — Du Contrôle supérieur du Comité consultatif d'hygiène.

Art. 11. Le Comité consultatif d'hygiène publique de France donne son avis :

1° Sur les règlements d'administration publique à intervenir pour la protection du travail industriel et sur les modifications à introduire dans les règlements en cours ;

2° Sur les instructions relatives à leur application;

3° Sur toutes les questions qui lui sont soumises par le Ministre du commerce relativement à la protection du travail industriel;

4° Sur les demandes de sursis et les réclamations de toute nature qui pourraient être formées devant le Ministre touchant les mesures à prendre par les intéressés dans leurs établissements industriels pour l'application de la loi du   et des règlements y relatifs;

5° Sur la création de circonscriptions nouvelles d'inspection; la modification des limites des circonscriptions existantes; la création ou la suppression d'emplois d'inspecteur adjoint; la fixation des résidences de ces agents;

6° Sur le choix des candidats aux emplois d'inspecteur et d'inspecteur adjoint, conformément aux dispositions de l'article 4 ci-dessus.

Les questions comprises dans les numéros 3 et 4 ne sont délibérées par le Comité consultatif d'hygiène publique de France qu'après que le Comité consultatif des arts et manufactures a été préalablement consulté.

Art. 12. Le Comité consultatif d'hygiène publique de France, chaque année, adresse au Ministre du commerce un rapport d'ensemble sur l'application de la loi.

Ce rapport est publié au *Journal officiel.*

Art. 13. Le Ministre du commerce est chargé, etc.

Projet de règlement d'administration publique sur la protection du travail industriel.

(En exécution de l'article 1er de la loi projetée.)

Article premier. Les prescriptions ci-après, destinées à assurer la salubrité et la sécurité du travail, seront observées à l'avenir, sous les peines portées par les articles 4 à 8 de la loi du
sur la protection du travail industriel dans tous les établissements industriels autres que ceux qui sont expressément affranchis du contrôle de l'Administration par l'article 1er de ladite loi.

TITRE Ier. — SALUBRITÉ.

ART. 2. Les emplacements affectés au travail, dans lesdits établissements, ainsi que toutes leurs dépendances, seront tenus dans un état constant de propreté. Le sol sera nettoyé à fond au moins une fois par jour à l'ouverture ou à la clôture du travail. Les murs et les plafonds seront l'objet de fréquents lavages; les enduits refaits toutes les fois qu'il sera nécessaire.

ART. 3. Dans les locaux où l'on travaille les matières organiques, le sol sera imperméable; les murs seront stuckés ou silicatés, ou recouverts d'une couche épaisse de peinture à base de zinc.

Le sol et les murs seront lavés aussi souvent qu'il sera nécessaire avec une solution désinfectante. En tout cas, un lessivage à fond aura lieu au moins deux fois par an.

Les résidus putrescibles ne devront jamais séjourner dans les locaux affectés au travail. Ils seront enlevés au fur et à mesure et immédiatement désinfectés.

ART. 4. L'atmosphère des ateliers et de tous autres locaux affectés au travail sera tenue constamment à l'abri de toute émanation provenant d'égouts, fossés, puisards, fosses d'aisances ou de toute autre source analogue.

Dans les établissements qui déversent les eaux résiduaires ou de lavage dans un égout public ou privé, toute communication entre l'égout et l'établissement sera nécessairement munie d'un intercepteur hydraulique fréquemment nettoyé et abondamment lavé au moins une fois par jour.

ART. 5. Les cabinets d'aisances seront abondamment pourvus d'eau, munis de cuvettes à fermeture hermétique avec inflexion siphoïde du tuyau de chute. Le sol, les parois seront en matériaux imperméables; les peintures seront à base de zinc.

Il y aura au moins un cabinet par 20 personnes.

Aucun puisard, puits absorbant, boitout, aucune disposition analogue ne pourra être établie qu'avec l'autorisation de l'Administration supérieure et dans les conditions qu'elle aura prescrites, sur l'avis du Comité consultatif d'hygiène publique de France.

ART. 6. Les locaux fermés, affectés au travail, ne seront jamais

encombrés. Le cube d'air, par ouvrier, ne sera jamais inférieur à 8 mètres.

Les locaux seront convenablement aérés et éclairés par de larges baies vitrées.

Dans les cas où les conditions du travail nuisent à l'aération et où la matière offre des causes spéciales d'insalubrité, la ventilation artificielle sera faite de telle sorte qu'il entre, par homme et par heure, une quantité d'air neuf de 24 mètres cubes au minimum.

Art. 7. Les poussières et gaz incommodes ou insalubres, les gaz et poussières toxiques seront évacués directement au dehors au moment même de leur production, et ne seront jamais mêlés à l'air des ateliers.

Pour les buées, vapeurs, gaz, poussières légères, il sera installé des hottes avec cheminées d'appel.

Pour les poussières déterminées par les meules, les batteurs, les broyeurs, et tous autres appareils mécaniques, il sera installé, autour des appareils, des tambours en communication avec une ventilation aspirante énergique.

Pour les gaz lourds, tels que vapeurs mercurielles, sulfure de carbone, la ventilation aura lieu *per descensum*, et chaque table de travail sera mise en communication directe avec le ventilateur.

Les vapeurs, les gaz, les poussières ne seront jamais déversés dans l'atmosphère; les gaz ou vapeurs seront condensés ou brûlés; les poussières seront dirigées sous les foyers ou recueillies dans des chambres à poussières.

La pulvérisation des matières irritantes ou toxiques et autres opérations telles que le tamisage, l'embarillage de ces matières, se fera automatiquement dans des appareils clos toutes les fois que cela sera possible.

Art. 8. Pendant les interruptions de travail pour les repas, les ateliers seront évacués et l'air en sera entièrement renouvelé.

Art. 9. Les ouvriers ne devront point prendre leurs repas dans les ateliers ni dans aucun local affecté au travail.

Les patrons mettront à la disposition de leur personnel les moyens d'assurer la propreté individuelle : vestiaire avec lavabos, et de l'eau de bonne qualité pour la boisson.

TITRE II. — Sécurité.

Art. 10. Tout mécanisme, machine, engin quelconque sera disposé de manière à ne présenter aucun danger.

Les moteurs à vapeur, à gaz, les moteurs électriques, les roues hydrauliques, les turbines seront installés dans des locaux séparés, fermés du côté où le travail s'effectue, et seulement accessibles aux ouvriers spéciaux affectés à leur surveillance, lesquels doivent être exclusivement choisis parmi les ouvriers adultes mâles.

Quand il s'agira de petits moteurs usuels à vapeur ou à gaz actuellement classés dans la deuxième et la troisième catégorie, l'autorisation pourra être donnée, moyennant prescription de précautions spéciales, d'installer le moteur dans l'atelier même; mais il sera dans ce cas entouré d'une barrière qui n'en permettra l'approche qu'aux ouvriers chargés de sa surveillance.

Les machines, mécanismes, outils, mus par ces moteurs, seront espacés entre eux d'au moins 60 centimètres. Le sol des intervalles sera nivelé; les escaliers seront solides et munis de fortes rampes.

Les machines, mécanismes, outils, seront, à moins d'autorisation contraire de l'Administration supérieure, entourés de barrières qui en empêcheront l'approche.

Les puits, trappes, cuves, bassins, réservoirs de liquides corrosifs ou chauds, seront pourvus de barrières ou de garde-corps.

Les échafaudages seront munis de garde-corps, de 90 centimètres de haut, sur toutes leurs faces.

Art. 11. Les monte-charges, ascenseurs, élévateurs, seront guidés et disposés de manière que la voie de la cage du monte-charge et des contrepoids soit fermée; que la fermeture du puits à l'entrée des galeries s'effectue automatiquement; que rien ne puisse tomber de la cage du monte-charges dans les galeries ni dans les puits.

Pour les monte-charges destinés à transporter des hommes, la charge devra être calculée au tiers de la charge admise pour le transport des marchandises, et les monte-charges seront pourvus de freins, chapeaux, parachutes ou autres appareils préservateurs.

Art. 12. Toutes les parties dangereuses et pièces saillantes des machines seront munies d'organes protecteurs, tels que gaines et chéneaux de bois ou de fer, tambours pour les courroies et les bielles, ou de couvre-engrenages, garde-mains, grillages, etc.

Les machines, outils à instruments tranchants, tournant à grande vitesse, telles que machines à scier, à fraiser, à raboter, découper, hacher; les cisailles, coupe-chiffons et autres engins semblables, seront disposés de telle sorte que les ouvriers ne puissent, du lieu où ils sont occupés, toucher involontairement les instruments tranchants.

On devra prendre les dispositions et régler les arrangements intérieurs de telle sorte qu'aucun ouvrier ne soit habituellement occupé à un travail quelconque dans le plan vertical ou aux abords immédiats d'un volant ou de tout autre engin pesant et tournant à grande vitesse.

Des grillages mobiles les préserveront de tout danger d'être atteints par les débris ou les éclats de la matière mise en œuvre.

Art. 13. La mise en train ou l'arrêt des machines doivent toujours être précédés d'un signal convenu.

Art. 14. Les conducteurs de machines, les contremaîtres ou chefs d'ateliers auront toujours, à portée de leur main, l'appareil destiné à arrêter la force motrice et les transmissions.

Le maniement des courroies sera toujours fait par le moyen de systèmes, tels que monte-courroies, porte-courroies, évitant l'emploi direct de la main.

Art. 15. Il est interdit de laisser les ouvriers procéder au graissage, à la visite, au nettoyage ou aux réparations de machines ou mécanismes en marche.

Si, les mécanismes étant arrêtés, la transmission marche encore, il ne sera procédé à ces opérations qu'après que le débrayage et le volant auront été convenablement calés.

Art. 16. En cas d'accident, le chef de l'établissement est tenu d'aviser immédiatement l'autorité chargée de la police locale ainsi que le service d'inspection du travail industriel. En cas d'accident par l'explosion d'une chaudière à vapeur, il doit en même temps prévenir le service des mines compétent.

Art. 17. Le présent règlement sera, à la diligence de l'Administration supérieure, affiché dans toutes les communes à la porte de la mairie.

TITRE III. — Dispositions transitoires.

Art. 18. Durant les trois mois qui suivront cette publication, tout intéressé aura le droit de provoquer, auprès du Ministre du

commerce, une visite de son établissement par le service d'inspection du travail industriel, et de se faire indiquer par ce service les dispositions qui seraient considérées comme ne remplissant pas les conditions de salubrité et de sécurité exigées par le règlement.

Le service d'inspection recevra les observations des industriels et les transmettra avec ses propres avis à l'Administration centrale, qui statuera, le Comité consultatif d'hygiène publique de France entendu.

Notification sera faite de cette décision aux intéressés par l'inspecteur du travail industriel de la région. Jusqu'à cette notification, aucun procès-verbal ne pourra être dressé sur les points réservés qui auraient été soumis à l'appréciation de l'Administration.

Si l'application des prescriptions du règlement nécessite une modification notable des dispositions de l'établissement, il sera accordé un premier sursis d'office calculé, dans les limites de la loi, d'après l'importance des modifications jugées nécessaires.

Passé le délai fixé par ce sursis, s'il n'est point renouvelé à la demande de l'intéressé, le présent règlement recevra sa pleine et entière exécution.

Art. 19. Le Ministre du commerce est chargé, etc.

Les conclusions du rapport et les projets de loi et de règlements ci-dessus ont été approuvés par le Comité dans sa séance du 1er décembre 1884.







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…me Office and Board of Trade Pamphlets on the …ubstitution of women …n industry for enlisted …en.

No. 1. CHINA AND EARTHENWARE TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

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* Manufacturers of articles not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(8443r—1.) Wt. 12913—430. 9150. 6/16. D & S. G. 1.

IV. Arrangements in the Factories.

Since the employment of women in many branches of the pottery industry is a custom of old standing, and the women substitutes taking temporarily the place of men will not be very numerous in any single department, probably few alterations in the arrangements or routine of the works will be necessary. The District Factory Inspectors and the Lady Factory Inspectors will be ready to advise and assist employers in regard to any matters that may arise.

The difficulty of employing women on heavy work may often be got over by mechanical means. Excellent examples of labour saving appliances have already been noted in a number of factories; among them, more than one system of trolley transport on run-ways and various types of lifting tackle.

March, 1916.



Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.



Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 2. POTTERY (COARSE WARE) AND BRICK TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade. The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export trade, should make every effort to maintain his business at the highest possible pitch.

(8444r—1.) Wt. 12913—430. 8150. 6/16. D & S. G. 1.

POTTERY (COARSE WARE) AND BRICK TRADE.

I. Processes in which Women can be substituted for Men.

As the various branches of the Pottery Industry which are grouped together under the general heading of "Coarse Ware" differ widely in the character of their products and their processes of manufacture, each branch is here considered separately in relation to the possible substitution of women for enlisted men.

The following is a list of processes in the various branches in which women can be suitably substituted for men, and have already been substituted for them in certain important areas. It has been compiled after prolonged expert enquiry in the chief coarse ware and brickmaking centres of England, Wales and Scotland.

1. *STONEWARE.*

(1) *Making.*—Stone bottles (up to 1 gallon), jam jars.

(2) *Turning.*—Jam jars.

(3) *Dipping.*—Jam jars, stone bottles (smaller sizes).

(4) *Packing.*—Jam jars. Men required for heavy carrying.

2. *WARE MADE FROM RED AND BUFF CLAY.*

(*a*) *Unglazed.*—Flowerpots, floor quarries, roofing tiles, land drains.

(1) *Throwing.*—Small and medium sizes } Flowerpot factories.

(2) *Taking from Presses* ... *Wheeling to Setters* ... *Drawing* ... } Floor quarry factories.

(3) *Taking off Machine* ... *Carrying to Kiln* ... } Land drain factories.

(*b*) *Glazed.*—Agricultural and Domestic Ware.*

(1) *Clay Preparing.*

(2) *Taking off from Thrower.*

(3) *Glazing.*

(4) *Setting.*

(5) *Drawing.*

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* Known according to locality as "Red Ware" "Brown Ware," "Black Ware" or "Sunderland Ware."

3. *FIRECLAY GOODS.*

(*a*) *Sanitary Ware.*—Baths, sinks, lavatories, etc.

(1) *Making.*—Small-sized sinks and lavatory basins, channels, fireclay taps up to 15 lbs.

(2) *Fettling and finishing* (3) *Application of bodies (slips) and glazes*, by means of brushes.	All kinds of ware, provided men are available to carry the heavier articles when ready for removal.

(*b*) *Sanitary Pipes.*

Carrying to and from kiln. (Small sizes only.)

(*c*) *Furnace Blocks and Linings. Firebricks.*

(1) *Making* and *laying-out* of hand-made furnace tiles.

(2) *Taking off* firebricks from presses.

(3) *Stacking up.*

(4) *Wheeling to kiln.*

(5) *Setting.*

4. *BRICKS.*

(*a*) *Common Bricks.*

(1) *Pressing.* (2) *Taking off from presses and loading on bogies.* (3) *Stacking.* (4) *Wheeling to kiln.* (5) *Setting.*

(*b*) *Glazed and Enamelled Bricks.*

(1) *Cutting Clay.* (2) *Moulding.* (3) *Pressing.* (4) *Taking off from Presses.* (5) *Finishing.* (6) *Dipping* (Putting on Slips, Glazing, Enamelling). (7) *Wheeling to kiln.* (8) *Setting.* (9) *Drawing.*

In certain districts of England and Scotland, the employment of women in the processes enumerated under 4 (*a*) and (*b*) or in some of them is customary in normal times.

5. *TOBACCO PIPES.*

Moulding.

Training.—In a few of the processes enumerated above women cannot be introduced without some training, but in the greater number, only a short period will be necessary, and in some practically none at all. Where training is required—as in flowerpot throwing and making of furnace-tiles by hand—experienced men over military age will no doubt be available as teachers.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply to the local Labour Exchange who will give them every assistance in obtaining the workers they want.

Selection.—In introducing women into employment of a heavy nature—such as, for example, the outdoor processes in brickmaking — careful selection is essential. Where exposure to weather and handling of considerable weights are involved, only women of strong physique and active habit are likely to make successful workers.

III. Relaxation of the Requirements of the Factory Acts.

To assist Coarse Ware Manufacturers in meeting difficulties caused by shortage of labour due to enlistment, the Home Office has made an Order sanctioning certain modifications of the Pottery Regulations for the period of the war. The Order allows the employment of women in cleaning floors and of boys under 15 in carrying clay. Full information as to the Order can be obtained from the District Inspector of Factories.

IV. Arrangements in the Factories.

The introduction of women substitutes into works in which no women were previously employed, will involve the taking of certain steps required by the Factory Acts, which are necessary for the convenience and health of the workers, such as the provision of separate and suitable sanitary accommodation. The District Factory Inspectors and the Lady Factory Inspectors will be ready to advise and assist employers in regard to any matters that may arise.

Where women have to be brought in from other districts, and difficulties arise in connection with their housing or transit, help in dealing with these will be given by the Labour Exchange Officials and the Local Advisory Committees where any have been appointed.

The difficulty of employing women on heavy work may often be got over by mechanical means. Excellent examples of labour saving appliances have already been noted in a number of factories; among them, in brick works, trollies or bogies precisely adjusted in height to the level at which bricks are taken off the press.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.



Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 3. INDIA RUBBER TRADES.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export trade, should make every effort to maintain his business at the highest possible pitch.

(8445r—1) Wt. 12913—430. 7150. 6/16. D & S. G. 1.

INDIA RUBBER TRADE.

I. Processes in which Women can be substituted for Men.

Owing to the wide range of the India Rubber Industry, beginning with manufacture from the raw material and extending into production of many diverse articles, the degree of possible substitution of women varies considerably in different classes of works. Remarkable success has attended the various experiments which have been made in this industry during the greater part of a year.

(A) *Manufacture and Reclaiming of Rubber.*—In this section the field is comparatively limited owing to—(*a*) the special danger for women of certain machines, (*b*) very heavy weights to be manipulated, (*c*) fumes of naphtha and carbon bisulphide, (*d*) mixing of poisonous ingredients, particularly lead with the rubber, (*e*) excessive wetness and heat of some processes.

Some substitution, however, of women (*adults* only) has been found to be practicable in the following processes, provided special care is taken as to physique, clothing, supervision by skilled men, help as to handling of heavy batches, and maintenance of good general ventilation for naphtha, and exhaust* for carbon bisulphide, fumes:—

1. On the *masticators* (crushing and washing).
2. As *assistants* in *stores* and *chemists'* department.
3. On the *mixing machines* (dry powders).
4. On the *mixing machines* (wet, preparatory to spreading).
5. On the *warming-up mills.*
6. Assisting on the *calenders* (feeding and taking off strip rubber).
7. Assisting on *drying cylinders.*
8. Assisting on the *spreading machines* (rough spreading and possibly, later on, texture spreading).

Where employment in spite of all practicable precautions remains particularly dangerous for women, or where decrease in output resulting from lack of skill cannot be overcome, substitution is not in general recommended, although under exceptional conditions it may be justified.

(B) *Manufacture of Rubber Articles.*—In this section of the industry, employment of women on an extensive scale is found to be practicable in many of the lighter processes and, with suitable arrangements, even in much

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* As prescribed by the Home Office Special Rules.

of the heavy work in connection with tyres and hose making and in the mould rooms. In the lighter processes girls also may be employed.

The following is a list of occupations and processes suitable for women, with the aid in some of them of lifting-tackle, holders, transporters, or labour-saving machines or other appliances, or by re-organisation:—

1. On the *measuring tables* and in pasting up of cloth in the spreading department.
2. In the various *moulding* departments, on hydraulic presses or in helping in light work at the *steam vulcanisers.*
3. In *cutting asbestos cloth and rubber for packing* and *canvas and rubber for tyres.*
4. In cutting and making up *washers, valves, joints,* and similar articles.
5. In *tyre cleaning* and *steel stud rivetting.*
6. In building up of *cycle and motor tyres*, especially on case-making machines.
7. In trimming and examining *tyres.*
8. In making and "blowing on and off" *cycle tubes.*
9. In building up of treads for *motor and cycle tyres* and in fixing of treads.
10. On covering and rubbering bands in the *solid tyre department.*
11. On the *tubing* machines.
12. On *machine-made hose* of small diameter, in making up by hand of shorter lengths of *vacuum hose* and in *corrugating vacuum hose.*
13. In *tube making by hand.*
14. As *assistants* in the processes of *hose making* of large diameter.
15. On "*armouring*" *machines* where hose of a small diameter is made.
16. In *varnishing* and *buffing* processes.
17. In the "*cold cure*" department (not permissible for girls).
18. In *cutting, sciving, and making up* hot-water bottles, cushions, and water beds.
19. In *cutting ground* sheets and *garments*, from trench capes to divers' dresses and aviator suits, by slot knife and short knife as well as at cutting machines.
20. In cutting and making up of *rubber gloves.*
21. Covering of *wringer rollers.*
22. In various *warehouse* processes.

It is understood that the Amalgamated Society of India Rubber Workers will raise no objection to introduction of women where circumstances at the present time necessitate substitution.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply to the local Labour Exchange, who will give them every assistance in obtaining the workers they want. In some cases, owing to the special need for women of strong physique, it may be necessary to bring them from other districts, and the fullest possible information should be given by employers in order to secure the right type of women.

III. Relaxation of the Factory Acts.

Orders sanctioning relaxations of the Factory Acts have been granted in many instances in order to meet pressure in carrying out orders for Crown supplies, export orders, or other work required in the national interest. Overtime for women and young persons has been allowed, and in some cases night shifts for women. Information as to mode of application for relaxations can be obtained from the Inspectors of Factories.

IV. Arrangements in the Factories.

Special arrangements, as indicated above, will be necessary to render the heavier and more dangerous processes possible for women. Care on the part of employers to secure the welfare of women brought in to take the place of men in the present emergency will greatly increase the probability of their employment proving successful.

The District Inspectors and Lady Inspectors of Factories are ready to advise and assist employers in regard to any questions as to health and safety or otherwise, which may arise in connection with the introduction of women. The assistance of Labour Exchange Officers and the Local Advisory Committees (where any have been appointed) may be invoked in case of special difficulties as regards lodging and transit of imported workers and other local welfare problems.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.

Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 4. COLOUR, PAINT AND VARNISH TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements between the trade associations of employers and operatives in regard to the question, and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export trade, should make every effort to maintain his business at the highest possible pitch.

(8446r—1.) Wt. 12913—430. 5150. 6/16. D & S. G. 1.

COLOUR, PAINT AND VARNISH TRADE.

I. Processes in which Women can be substituted for Men.

Recent enquiries show that in individual factories women are already doing satisfactorily work hitherto commonly performed by men in the following processes :—

1. *Colour Mixing.*—Stirring the liquid in the colour mixing vats or becks, placing the wet colour in the presses, removing wet cakes of colour from the presses, washing and cleaning the frames in the presses.
2. *Grinding.*—Attending to cone mills and roller mills. Removing the paint from the rollers as the grinding proceeds, and, in some cases where automatic feed does not exist, feeding the rolls. Cleaning mills when colour is changed. Where large vessels are filled one man to every three women would meet the difficulty of lifting heavy weights.
3. *Packing and Filling.*—Putting dry colours into packets and small tins, and filling small tins of ready mixed paint.
4. *Filling Varnish.*—Attending Roberts' or other filling machines.
5. *Dipping, Washing and Soldering of Tins.*
6. *Painting Kegs and Drums.*
7. *Mounting Shade or Colour Cards.*
8. *Labelling and Stencilling of packages.*

The difficulties arising from the heavy nature of some of the work to be performed can often be overcome by re-organisation of duties. For example, the task of lifting or moving heavy weights can be assigned to men while women can be employed on the lighter processes.

Training.—Little skill is required in any of the above operations, and a very short period of training would suffice.

II. Supply of Women workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the local Labour Exchange who will give them every assistance in obtaining the workers they want.

III. Arrangements in the Factories.

The introduction of women into factories where males only have been employed hitherto will necessitate some temporary re-arrangement of sanitary accommodation. Where women are employed in wet processes, clogs and suitable overalls should be provided for their protection. The District Inspectors and Senior Lady Inspectors of Factories will be ready to advise and assist Employers in regard to this or any other matter that may arise.

May, 1916.



Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.



Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No 5. WOOL INDUSTRY.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

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* Manufacturers of goods not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(8447r—1.) Wt. 12913—430. 5450. 6/16. D & S. G. 1.

THE WOOL INDUSTRY.

I. Processes in which Women can be substituted for Men.

The substitution of women's labour for enlisted men during the present emergency has been the subject of a series of conferences between representatives of employers and employed in the West Riding area of Yorkshire. A final Agreement as to the processes in which substitution is possible and the conditions of such substitution was signed on 23rd February, 1916. The following is a list of the processes in which it is agreed that women can replace men.

A. Woollen Spinning and Weaving.

(1) Carding and Condensing machine minding.
(2) Mule Spinning.
(3) Warping.
(4) Twisting in, except in the loom.
(5) Weaving, except in very few cases.

B. Worsted Spinning and Weaving.

(1) Wool sorting to some extent.
(2) Carding machine minding.
(3) Gilling machine minding.
(4) Combing machine minding.
(5) Back-washing machine minding.
(6) Warping.
(7) Twisting in, except in the loom.
(8) Weaving, except to about 5 per cent.
(9) Perching, if men lift the pieces.

Since the above Agreement was signed, further attempts to introduce women's labour have been successfully made. In the woollen section women are minding (a) rag grinding machines, and (b) assisting in the willeying process. In the worsted section women are now acting, after training, as second overlookers in the spinning department. In woollen cloth finishing, unless men are available for handling the pieces, further developments are hardly possible except for cloth packing and the process of cropping. In worsted cloth finishing women's labour can be introduced successfully throughout the various processes to the extent of 30 to 40 per cent., but such introduction will necessarily be gradual.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply to the local Labour Exchange, who will give them every assistance in obtaining the workers they want.

III. Relaxation of the Factory Acts.

Permission to employ women and young persons overtime is, from time to time, given by the Home Office to enable manufacturers to meet pressure of orders for the Government or for the export trade. The Order now in force (which will expire on the 10th June) allows six hours overtime a week for all processes, except weaving, in Woollen and Worsted factories in which the work being done on behalf of the Crown, or for export to foreign countries, amounts to 75 per cent. or more of the whole of the work being done.

In special circumstances, and under certain conditions, the employment of women in night shifts, in the processes of carding and spinning in the Woollen industry, and in wool-combing in the Worsted industry, is also permitted.

Any occupier desiring to avail himself of either of the aforementioned schemes of employment must apply to the Inspector of Factories for the district.

IV. Arrangements in the Factories.

The District Inspectors and Lady Inspectors of Factories are ready to advise employers in regard to questions of health and safety in the factories. Since employment of women is general in the Wool Industry, and the additional women substitutes will not be very numerous in any single department, probably few alterations in the arrangements of the works will be necessary.

The assistance of Labour Exchange Officers and of the Local Advisory Committees (where any have been appointed) may be invoked in case of special difficulties as regards lodging and transit of imported workers and other local welfare problems.

May, 1916.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.



Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 6. PAPER MAKING.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export trade, should make every effort to maintain his business at the highest possible pitch.

(8448r—1.) Wt. 12913—430. 8150. 6/16. D & S. G. 1.

PAPER MAKING.

I. Processes in which Women can be substituted for Men.

Paper making being a continuous process, the statutory prohibition of the night employment of women has caused many operations to be confined to males. The temporary relaxation, however, of this prohibition in the present national emergency has very much widened the scope of women's labour in paper mills, and their ability to perform much of the work is becoming recognized.

Women and girls have already been substituted on the following processes :—

A. PREPARATORY PROCESSES :—

(1) Stowing bales of esparto or wood pulp.
(2) Trucking bales of wood pulp (up to 4 cwt.).
(3) Opening bales of chemical and mechanical pulp.
(4) Working hand crane to load carts and trucks.

B. MANUFACTURING PROCESSES :—

(1) Feeding mechanical pulp into willowing machines.
(2)*Feeding esparto into willowing machines and boilers.
(3)*Trucking from esparto boilers.
(4) Feeding mechanical and chemical pulp into potchers and beaters.
(5) Feeding rags and paper chippings into pulping machines.
(6) Feeding edge runners or "rollergang" machines.
(7) Assisting at coating machines.
(8) Assisting at calenders.

C. FINISHING AND WAREHOUSE PROCESSES :—

(1)*Assisting at some kinds of reeling machines.
(2) Filling cutting machines (with aid of lifting tackle).
(3) Assisting to pack webs of paper (up to 1,650 lbs. weight), and transporting these on trucks.
(4) Tying and bundling into reams and half reams (generally up to about 40 lbs. weight but in one case a weight of 130 lbs. was being dealt with).
(5) Trucking and general warehouse work.
(6) Sewing up bales for export.
(7) Loading vans and railway trucks.

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* These processes were sometimes done by women before the war.

In view of the wide variations in the machinery and general conditions in the different mills, it is not suggested that the processes named can always be assigned to women, but while the circumstances of each factory must be considered it is certain that many manufacturers have failed to grasp fully the assistance which women can render. In some works very few attempts have so far been made to introduce women in place of men, whereas in other works, the substitution has already been carried very far.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply to the local Labour Exchange who will give them every assistance in obtaining the workers they want. In some cases, owing to the special need for women of strong physique, it may be necessary to bring them from other districts, and the fullest possible information should be given by employers in order to secure the right type of women.

The supply of women can be frequently increased by adaptation of the conditions of employment to local circumstances. For example, one large mill in a district where ordinary factory operatives were scarce obtained many married women by arranging the hours of work to suit household exigencies. In one department these hours were from 10 a.m. to 5 p.m. while another branch was kept going by two shifts of women, one set working from 7 a.m. to midday and the other from 1 p.m. to 6 p.m.

III. Relaxation of the Factory Acts.

An order has been made allowing (subject to conditions) the employment of women over 18 either in three shifts of eight hours each or in two shifts of 12 hours each, while in special cases, overtime for young persons and women has been authorised. Application should be made to the Inspector of Factories if any relaxation of the law is required.

IV. Arrangements in the Factories.

Care on the part of employers to secure the welfare of women brought in to meet the present emergency will greatly increase the probability of their employment proving successful.

Special attention should be given to the fencing of all driving straps, gear or shafting which may be within reach

of the worker. Women engaged near machinery should be suitably clothed and their hair should not be worn loose, but confined by a cap or other suitable means. Women of strong physique should be selected for labouring work such as the transport of material. Work can be facilitated by the employment of mechanical aids such as good lifting tackle, inclined planes, easy running trucks and similar appliances. In some cases, parcels of paper have been reduced in weight so as to avoid risk of strain to young girls.

The District Inspectors and Lady Inspectors of Factories are ready to advise employers in regard to any questions as to health and safety or otherwise which may arise in connection with the introduction of women.

The assistance of Labour Exchange Officers and the Local Advisory Committees (where any have been appointed) may be invoked in case of special difficulties as regards lodging and transit of imported workers and other local welfare problems.

April, 1916.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.

Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 7. COTTON TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

* Manufacturers of articles not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(8449r—1.) Wt. 12913—130. 9650. 6/16. D & S. G. 1.

COTTON TRADE

I. Processes in which Women can be substituted for Men.

The preponderance of female employment in most departments restricts the possibilities of substitution, but there is none the less a wide field of operation, and much can be done, by re-organisation and by the introduction of female labour into processes hitherto reserved for men, to fill the gaps caused by enlistment for military service. The following summary, based on information recently collected, indicates practical measures of re-organisation that have already been adopted in individual mills.

(*a*) *BLOWING ROOM.*—Women can be suitably employed in mixing, opening, spreading, and as assistants at scutchers or waste breakers. Where runways are provided, or the laps are not too large and heavy, women may be employed as lap carriers.

(*b*) *CARD ROOM.*—(1) Some re-arrangement of the work of strippers and grinders is possible, which would allow individual workers to attend to more machines, while their subsidiary work (*e.g.*, oiling and cleaning) is done by women and young persons.

(2) Women can suitably be employed as tenters to Derby Doublers or Condensers.

(*c*) *RING SPINNING.*—Work now done by banders and jobbers is suitable for women.

(*d*) *MULE SPINNING.*—Shortage of labour can be made good by (a) an extension of the system of "joiner minding," and (b) employment of women and girls as big and little piecers, also as creelers and to fill tube boxes.

(*e*) *DOUBLING.*—In some cases, men have taken the place of women on doubling frames, to enable the frames to be kept running continuously night and day. Such men could be replaced by women in suitable cases, by obtaining from the Home Office an Order allowing different meal hours for different sets of workers and permitting night work.

(*f*) *WEAVING.*—A higher proportion of women weavers can be employed. In some classes of weaving young weavers can be promoted at an earlier age, and an increased number of looms can be assigned to individual weavers in suitable cases.

(*g*) *SUBSIDIARY WEAVING PROCESSES.*—Re-organisation can be effected by temporarily drawing male workers from the weaving shed to act as over-lookers or to assist the tape-sizers. Women can suitably be employed in "beaming", and "ball warping" for light warps under 30 lbs. if balling machines are employed; and as "drawers" and "twisters."

(*h*) *WAREHOUSES.*—In the spinning section, cop-packing in cases or skips (but not in casks), knotting and pressing bundles and making up bundles can be much more generally performed by women, as may also cloth looking (this requires considerable training), cutting and straightening, cutting patterns, attending plaiting and creasing machines, marking off and ticketing, light hooking and stamping, papering, parcelling, or making up light goods in the weaving section.

Training.—Some slight period must elapse before full efficiency is attained, more particularly in the ring-room, on the mules and in some of the subsidiary weaving processes, but the necessary skill and training can be readily acquired by any intelligent worker.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the Local Labour Exchange, who will give them every assistance in obtaining the workers they want. As there are throughout the cotton districts numbers of women who have had experience in the trade, but who for various reasons have left it, it is not expected that it will be necessary to bring in women from other districts.

III. Trade Agreements.

At a joint meeting of the Employers' and Operatives' Associations (at which, however, the Spinners were not represented), an agreement was reached in principle as to the modification of trade rules and customs necessary for the introduction of females to take the place of men during the war, and it was arranged that points of detail were to be settled locally through the agency of the ordinary trade machinery. In the case of the Spinners, while there is no general agreement as to the introduction of female labour, it has been left to the Branch Societies in the different districts to take such action as might

be considered desirable, and agreements have been made between Employers and Operatives in the important spinning centres of Oldham and Ashton-under-Lyne. In Manchester, Bolton and Wigan female labour has always been employed in mule spinning rooms.

IV. Arrangements in the Factories.

Since women are already employed in most branches of the Cotton industry, probably few alterations in the arrangements or routine of the works will be necessary, and the changes proposed will not necessitate relaxation of the Factory Acts. The District Inspectors and Lady Inspectors of Factories will, however, be glad to advise Employers in regard to any points of difficulty that may arise.

April, 1916.



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Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 8. HOSIERY TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in crder to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

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* Manufacturers of articles not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(8450r—1.) Wt. 12913—430. 7150. 6/16. D & S. G. 1.

HOSIERY MANUFACTURING AND FINISHING TRADE.

I. Processes in which Women can be substituted for Men.

In the *Knitting* Departments the practice as to the class of workers on the same type of machine varies in different parts of the country. In Scotland, women are customarily employed in charge of almost every kind of knitting machine and they work exactly on the same conditions as men, even on the largest Cottons' Patents' machines. In England, few women have been employed in the past on these or other large machines. There are a few cases where the Scotch practice has been followed, but in the great majority of works, women have been restricted to the lighter knitting machines.

Substitution of women has during the present emergency taken place, in many cases, on various types of circular and flat machines formerly worked by enlisted men, and, in some instances, women are being employed as assistants to men on the larger machines. In one large factory, where each Cottons' Patents' machine was formerly worked by one man, the skilled men now each attend two machines with the help of a woman assistant. Other machines on which substitution has been noted are Dubied's, Harrison's and other flat machines, Jersey and other heads, X.L., Pearl and Scott-Williams' machines.

In the *Making-up* Departments women are now being employed in place of men as overlookers.

In the *Warehouse* Departments women are being largely introduced into men's processes of folding and other work at the counters, and in packing.

In the *Finishing* Department women are being largely employed in trimming (boarding and pressing) work. In England this process has been hitherto restricted to men and boys. Women have also been introduced as assistants at large raising machines. There are other machines (*e.g.*, drying machines) at which they could usefully assist to a small extent.

All the above-mentioned processes appear to be quite suitable for women during the present emergency. There is much scope for further replacement on the same lines now that the introduction of women has been facilitated by the Agreements referred to in paragraph IV. below.

Training.—In most of the processes a period of training is found necessary before the new workers become of service. Several of the Trade Unions have made Agreements with the employers to regulate the conditions under which skilled workmen shall train the women in the factories. The Agreements provide for reasonable time wages, both for the women introduced and for the skilled men, during the period of training. In some cases where training during the day would interfere with output, arrangements have been made, with the approval of the Home Office, to train women in the evening, after ordinary working hours.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the Local Labour Exchange who will give them every assistance in obtaining the workers they want. In only a few cases is it expected that it may be necessary to bring in women from other districts for this industry.

III. Relaxation of Factory Acts.

The Home Office has made an Order allowing overtime for women and certain young persons in all hosiery processes. Special Orders to permit the training of women after working hours have also been given. Full information can be obtained from the District Inspector of Factories.

IV. Arrangements with Trade Unions.

Conferences between Trade Unions and Employers' Associations in the trade have been held by the Home Office at Leicester and Nottingham and Agreements were obtained under which all rules and customs operating to restrict certain employments to men have been suspended during the war on agreed conditions. The Agreements have been widely published. The main conditions are: (1) that the suspension shall be temporary; (2) that women shall only be employed in substitution for men where and so long as it is not found possible to obtain male operatives; and (3) that the women introduced shall be paid the same wage-rates as men for equivalent work.

V. Arrangements in the Factories.

As women have always been employed in hosiery factories, it is probable that few, if any, alterations will be required through the extension of such employment in

most cases. It should be kept in mind, however, that care on the part of employers to secure the welfare of women brought in to replace men during the present emergency will greatly increase the probability of their employment proving successful.

The District Inspectors and Lady Inspectors of Factories are ready to advise and assist employers in regard to any questions as to health and safety or otherwise which may arise in connection with the introduction of women. The assistance of Labour Exchange Officers and the Local Advisory Committees (where any have been appointed) may be invoked in case of special difficulties as regards lodging and transit of imported workers and other local welfare problems.

May, 1916.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.

Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 9. WOOD-WORKING TRADES.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question ; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export trade, should make every effort to maintain his business at the highest possible pitch.

(8451r—1.) Wt. 12913—430. 7150. 6/16. D & S G. 1.

WOODWORKING TRADES.

I. Branches and Processes in which Women can be substituted for Men.

Sawing and Planing Mills.—This is the department the least likely to furnish an opening for female labour, but women and girls can be employed in light work in the following processes:—

Small circular saw feeding;
Taking-off or drawing from circular saws;
Feeding and taking-off from planing and moulding machines;
Boring, mortising, dovetailing, and tenoning machine work;
Straight work on the vertical spindle;
Light carrying and trucking.

Box and Packing Case Making.—There is considerable scope for the employment of women in box and light case making factories. In addition to the saw mill processes mentioned above, women have been successfully employed on jointing, matching, tongueing and grooving, hand-holeing, boring, recessing, nailing, screwing, wire stitching, corner hinging, sand-papering, buffing and finishing, printing and branding machinery. Certain kinds of ammunition box work are well within their powers, including drilling, screwing, nailing, jointing-up bottoms, and knotting and splicing handles.

Furniture Trades.—In large works with a variety of special machine tools there is scope for the employment of women in light repetition machine work on the lines indicated above. In the cheap cabinet trade the cramping, dowelling, glueing, and cleaning-up of small articles have been done. Fret work, carving by hand and by machine, inlaying, sand-papering, painting, staining, and french-polishing are all done by women at one place or another. In upholstery, cover making, sewing, cording, and finishing have always been women's work, and these have been extended in such directions as filling, drawing, and buttoning cushions and mattresses, fixing webs and springs, and seating throughout pin-stuffed chairs.

General.—Light repetition wood turning is being done by women, *e.g.*, bobbins, brush and tool handles, and

certain kinds of chair legs. Picture and photo frame making, fire-wood cutting and bundling, and a large range of light unskilled woodworking occupations of a repetition character all afford opportunities for the employment of female labour.

Training.—In a few of the processes enumerated above women could not be utilised without some training, but in the greater number only a short period would be necessary. Tools and cutters would usually have to be ground and set-up by skilled machinists, and in most factories these and other men over military age would be available as teachers.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the Local Labour Exchange which will assist them to obtain the workers they want. In only a few cases is it expected that it may be necessary to transfer women from one district to another.

III. Relaxation of the Factory Act Requirements.

A General Order has been made allowing in non-textile works in which urgent Government work, or other work *required in the national interest* is being done, special hours of work for women, girls over sixteen and boys over fourteen years of age. This Order allows a maximum daily period of employment of fourteen hours (less two hours for meal times) subject to the conditions that the weekly total of hours does not exceed sixty, exclusive of meal times, and that no overtime is worked on Saturday.

Any occupier desiring to avail himself of the provisions of this Order must apply for permission through the District Inspector of Factories.

IV. Arrangements in the Factories.

The introduction of women into factories where males only have been employed hitherto will necessitate some temporary re-arrangement of sanitary accommodation. Special attention should be paid to the fencing of belts, pulleys, and machine tools. Various kinds of cramps or holders are desirable for small work. The District

Inspectors and Senior Lady Inspectors of Factories will be ready to advise and assist employers in regard to any such matters that may arise.

May, 1916.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.





Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 10. LEATHER TANNING AND CURRYING TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export trade, should make every effort to maintain his business at the highest possible pitch.

(8452r—1.) Wt. 12913—130. 6650. 6/16. D & S. G. 1.

LEATHER TANNING AND CURRYING TRADE.

I. Processes in which Women can replace Men.

Previous to the war this trade was carried on by male labour, but experience shows that in many departments the work can be done by women. The trade may be divided into three classes: (1) Tanning of heavy leather; (2) Tanning and currying of light leather; and (3) Chrome tanning, which differ as to the work on which women can be employed, and to some extent require different types of women workers. Thus work at the lime and tan pits with the offal (*i.e.*, bellies, heads, and shoulders) in the heavy leather tanneries requires women of strong physique, and it is both wet and dirty, necessitating special clothing to protect them (*i.e.*, leggings and macintosh aprons); whereas work on the softening machines in the light leather trade (sheep skins, &c.) calls for no special strength and is both dry and clean.

Women are employed in—

A. *Heavy Leather Trade*:—

All the processes in the tanning of offal parts as well as the following:—

(1) *Scraping off hair which the machines have failed to remove.
(2) *Handling offal and light-weight leather at the lime pits.
(3) *Working offal and light-weight leather in the tan pits—taking it from pit to pit and hooking from the pits.
(4) Attending to the liquor pumps at the tan pits.
(5) Handling light-weight leather at the pits—known locally as "handling at slings."
(6) In the drying sheds: Carrying off from machines, oiling, washing and hanging of all offal parts and assisting to oil the "bends" (*i.e.*, the heavier pieces, backs, &c.); the men do the heavy lifting and the women help them.

---

* Wet and dirty work which requires the provision of special clothing (leggings and macintosh aprons) so as to keep the workers' clothes dry.

(7) Attending to polishing, splitting, and setting machines working offal parts.
(8) Assisting at stretching, pinner, and scouring machines.

B. *Light Leather Trade*:—
(1) Attending to the following machines:—
(*a*) Sizeing (brushing on).
(*b*) Staking (softening machines).
(*c*) Buffing and brushing-off machines—known in some places as "wheeling."
(*d*) Rolling, glazing, embossing, and printing.
(2) Washing, oiling, and staining leather (hand work).
(3) Straining (stretching on to racks)—hand work.
(4) Hanging leather in drying sheds or stoves.
(5) Oiling and seasoning (hand work).
(6) Ironing (hand work).

In tanning leathers for glacé kid:—
(7) *Emptying barrels (goat skins).
(8) Opening out and piling on horses the skins taken from the tumblers.
(9) *Emptying the tumblers.

In tanning leather for gloves:—
(10) Washing and scouring.
(11) Attending to vats and paddles (tanning process).

C. *Chrome Tanning*:—
(1) Serial striking-out machines (back and front).
(2) Single striking-out machines (back only).
(3) Tanhouse labouring:—
(*a*) Currying.
(*b*) Dipping in hypo and acid liquors.
(*c*) Horsing up in tanhouse.
(*d*) Blue striking out.
(4) Currying and Fat Liquoring Department Dye House:—
(*a*) Helping in labouring except on shaving machines.
(*b*) Stoves.
(5) Fluffing and buffing machines.
(6) Finishing tables:—
(*a*) Seasoning.
(*b*) Stuffing.
(*c*) Colouring (but not on graining or glacé).
(7) Glazing machines (slow action only).

* Wet and dirty work which requires the provision of special clothing (leggings and macintosh aprons) so as to keep the workers' clothes dry.

D. *In all Classes of Work:—*

(1) Hair sorting and drying.

(2) Warehouse work:—

Sorting lighter pieces of leather.
Assisting to select leather.
Assisting packers.
Carrying off from sorters and storing in racks.
Attending to measuring machines.

(3) Cleaning up and general labourers' work—both in the yards and the factory.

(4) Clerical work—taking weights of hides and leather and acting as timekeeper.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the local Labour Exchange, who will give them every assistance in obtaining the workers they want.

As indicated above the class of worker required varies with the work to be done; some of the processes require women of more than average physique and others, which involve exposure to wet and dirty processes, would only be undertaken by those who are accustomed to rough work. Where heavy weights have to be moved, the work could be facilitated by use of good lifting tackle or similar labour-saving devices. So far there does not appear to have been any difficulty in meeting the demand for women workers where it has been decided to give them a trial and adequate wages have been offered.

III. Relaxation of the Factory Acts.

Orders sanctioning overtime for women and young persons have been granted in many instances in order to meet pressure in carrying out orders for Crown supplies, export orders, or other work required in the national interest. Information as to mode of application for relaxations can be obtained from the Inspectors of Factories.

IV. Arrangements in the Factories.

Special arrangements, as indicated above, will be necessary to make the heavier and rougher processes suitable for women. Suitable dressing and lavatory accommodation and facilities for cooking and taking food are also of special importance in these works. Care on the part of employers to secure the welfare of women brought in

to take the place of men in the present emergency will greatly increase the probability of their employment proving successful.

The District Inspectors and Lady Inspectors of Factories are ready to advise and assist employers in regard to any questions as to health and safety or otherwise which may arise in connection with the introduction of women. The assistance of Labour Exchange Officers and the Local Advisory Committees (where any have been appointed) may be invoked in case of special difficulties as regards lodging and transit of imported workers and other local welfare problems.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.





Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 11. SOAP AND CANDLE TRADES.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

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* Manufacturers of articles not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(S153r—1.) Wt. 12913—430. 6650. 6/16. D & S. G. 1.

SOAP AND CANDLE TRADES.

I. Processes in which women can be substituted for men.

In the initial processes of soap and candle making it has not been found practicable to employ women to any great extent owing to the heavy nature of the work; but much of the lighter work, formerly carried on by men and youths, is now being successfully done by women. The following is a list of processes in which it has been found that women's labour can be utilised :—

SOAP.—

(1) In the Melting department. (a) *Rolling full and empty barrels.* (b) *Scraping resin off barrel staves.*

(2) In the Soap boiling department. (a) *Regulating full pipe.* (b) *Carrying fob.*

(3) *Attending to crutching machines.*

(4) *Carrying* and emptying cases in melting house (transparent toilet soap).

(5) *Bar Moulding* (household soap).

(6) *Cutting slabs into bars*; *Cutting bars into short pieces*; *Taking off at cutter and piling.*

(7) *Shredding and drying* (toilet soap).

(8) *Tending mixing machine* (toilet soap).

(9) *Milling* (toilet soap).

(10) *Plodding* (toilet soap).

(11) *Hand Stamping.*

(12) *Machine Stamping* (with or without power).

(13) *Trimming* (toilet soap).

(14) *Trucking.*

(15) *Can filling.* (a) With *Liquid soap*; (b) With *Soft soap.*

(16) *Wrapping and packing* (light work).

(17) *Loading vans* (light work).

(18) *Filling drums* with glycerine from large vats.

CANDLES.—

(1) *Scraping and packing* of block paraffin wax (light blocks).

(2) *Winding*, doubling, plaiting and bleaching wicks.

(3) *Candle Making*—Filling, winding up and emptying in moulding department.
In some factories with the present equipment the work would be too laborious for women, and substitution of women would necessitate some reorganisation of the work.

(4) *Casting dips.*

(5) *Stamping name* on candles.

(6) *Wrapping* small bundles.

(7) *Packing* small boxes.

(8) *Making night-light cases.*

(9) *Putting wicks* in night-lights.

BOX MAKING.—Nailing boxes and stenciling.

Training.—In some of the above processes, time and practice are necessary in order to attain the requisite speed.

In the making and dipping of candles, a certain amount of skill is needed, but this can be acquired in a moderately short time as the work the women are doing does not call for a high degree of technical knowledge.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the Local Labour Exchange who will give them every assistance in obtaining the workers they want. In only a few cases is it expected that it may be necessary to bring in women from other districts for this industry.

III. Relaxation of the requirements of the Factory Acts.

To facilitate the substitution of women labour and maintain the output in this industry, the Home Office have, where necessary, made Emergency Orders granting certain facilities for employment of women in shifts or on overtime, but in most cases the ordinary periods of employment under the Factory Acts would appear to meet the necessities of the case and are generally worked in the women's department.

Information regarding Emergency Orders can be obtained from the Inspectors of Factories.

IV. Arrangements in the Factories.

As women were already employed in certain incidental processes in soap and candle making, it is probable that their further employment will not entail much alteration in the arrangements of the factory. The District Inspectors and Senior Lady Inspectors of Factories will be ready to advise and assist employers in regard to any matters that may arise.

The difficulty of employing women on heavy work may often be got over by mechanical means. Good examples of labour saving appliances have already been noted in several factories, *e.g.*, mechanical conveyors in packing department, etc.

May, 1916.



Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers London, S.W.



Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 12. GLOVE TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question ; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

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* Manufacturers of articles not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(8342—1.) Wt. 11203—G 382. 6500. 6/16. D & S. G. 1.

THE GLOVE INDUSTRY.

I. Processes in which Women can be substituted for Men.

The initial processes of preparing the tanned skins and cutting-out, the finishing process known as laying-out and the cutting of fabric gloves, have been, in the past, almost entirely restricted to men by trade customs of long standing. Much of this work is highly skilled and requires a long period of training, but women have been successfully introduced to replace men in the following processes in a few works, and there appears to be much scope for further replacement on these lines:—

(1.) Wheeling, buffing, and padding skins.
(2.) Cutting-out chamois and other light leathers, and assisting skilled cutters in preparing thumb and finger parts, and in pulling-down.
(3.) Cutting of furs and gauntlet parts.
(4.) Punching or webbing.
(5.) Laying-out or ironing.

Women could also assist in cutting out fabric gloves.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the Local Labour Exchange, who will give them every assistance in obtaining the workers they want.

III. Trade Agreements.

A conference between the Trade Unions and the Employers' Association in the trade has been held by the Home Office at Yeovil, and an Agreement was concluded, under which all rules and customs operating to restrict particular employments to men have been suspended during the war, on certain conditions, the chief of which are:—(1) that the suspension shall have effect only during the continuance of the war; (2) that women shall only be employed in substitution for men where and so long as it is not found possible to obtain male operatives; and (3) that the women introduced shall be paid the same wage-rates as men for equivalent work.

IV. Arrangements in the Factories.

The District Inspectors and Lady Inspectors of Factories are ready to advise employers in regard to any questions as to health and safety or otherwise which may arise in connection with the introduction of women. Since employment of women is already general in the glove industry, and the additional women substitutes will not be very numerous in any single department, probably few alterations in the arrangements of the works will be necessary.

June, 1916.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.





Home Office and Board of Trade Pamphlets on the substitution of women in industry for enlisted men.

No. 13. HEAVY CLOTHING TRADE.

This is one of a series of notes relating to various industries which are being issued by the Government with the object of making available for manufacturers all over the country the fullest information as to the processes in which, and the methods by which, temporary substitution of women for enlisted men is already being successfully carried out in their trade.

The notes will also give particulars of any arrangements made between the trade associations of employers and operatives in regard to the question; and any adaptation of the Factory Act requirements in regard to hours or other matters which the Home Office are allowing in order to facilitate the employment of women.

In the interests of the nation, it is of vital importance that every manufacturer who is producing articles required for the prosecution of the war, for the support of the population or for the export* trade, should make every effort to maintain his business at the highest possible pitch.

* Manufacturers of goods not required for military use or for the maintenance of the civil population, can render material service to the country by giving preference to Export orders as against those for purely Home trade.

(8151r—1.) Wt. 12913—130. 6650. 6/16. D & S. G. 1.

HEAVY CLOTHING TRADE.

I. Processes in which Women can be substituted for Men.

Women already before the war constituted the majority of those employed in this trade, and most of the processes were women's processes. The important departments, however, of cutting, trimming, and fitting up were carried on in the main by male operatives only. The increasing shortage of male labour, due to enlistment of the younger men, has now made some temporary reorganisation of these departments for the duration of the war necessary, if the trade is to continue active. Careful enquiry in all the chief centres of the clothing trade as to the possibilities of substitution has shown that women can be suitably employed in:—

1. Cutting.
2. Trimming.
3. Fitting up.

The terms "cutting," "trimming," and "fitting up" are used to cover the following processes:—

(*a*) Marking in or marking up;
(*b*) Laying up or folding cloth or linings or other material;
(*c*) Cutting (except with the band knife);
(*d*) Dividing;
(*e*) Fitting up;

and any other processes usually connected with these branches of the trade.

Training.—As in all the processes enumerated women will at the outset be employed as assistants under the supervision of skilled men, they can be gradually trained to the performance of the more difficult operations while rendering useful service in those which are subsidiary and comparatively simple.

II. Supply of Women Workers.

Special arrangements have been made by the Government for recruiting women workers to take the place of enlisted men. Employers should apply without delay to the local Labour Exchange, where they will be given every assistance in obtaining the workers they want. As the pressure upon manufacturers in the clothing trade centres, due to the demands of the War Office in the

earlier stages of the war, has now been greatly relaxed, no difficulty should arise in securing women with some experience in the industry, and it will probably be unnecessary to bring in women from other districts.

III. Trade Agreements.

Following on Conferences held by the Home Office with the Council of the Federation of Wholesale Clothiers and the Executive of the Amalgamated Union of Clothiers' Operatives respectively, the Employers' Federation have undertaken to observe certain conditions in regard to the substitution of women's labour during the war, and the Union have, on these conditions, undertaken not to oppose the substitution of women. The conditions include the reinstatement of the men who have left to join the colours, reversion to pre-war conditions in factories and workshops after the war, payment to women of the same piece-rate as that paid to the men they replace and of a minimum time-rate fixed by the Tailoring Trade Board. Payment of the rates fixed by the Trade Board is being made a condition of tender for War Office and other Government contracts.

IV. Arrangements in the Factories.

Women being already largely employed everywhere in the clothing industry, their temporary employment in the cutting and allied departments will necessitate few alterations in the arrangements or routine of the factories. The District Inspectors and Lady Inspectors of Factories will, however, be glad to advise employers in regard to any points of difficulty that may arise.

May, 1916.

Copies of this pamphlet can be obtained on application to the District Inspector of Factories or to the local Labour Exchange Manager, or to the Employment Department, Board of Trade, Queen Anne's Chambers, London, S.W.



LIFE AND DEATH
IN THE
MEDICAL PROFESSION

HOFFMAN

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LIFE AND DEATH IN THE MEDICAL PROFESSION

By

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There are men and classes of men that stand above the common herd—the soldier, the sailor, and the shepherd not infrequently; the artist rarely; rarelier still, the clergyman; the physician almost as a rule—he is the flower (such as it is) of our civilization; and when that stage of man is done with, and only to be marveled at in history, he will be thought to have shared as little as any in the defects of the period, and most notably exhibited the virtues of the race. Generosity he has, such as is possible to those that practise an art, never to those who drive a trade; discretion, tested by a hundred secrets; tact, tried in a thousand embarrassments; and what are more important, Herculean cheerfulness and courage so that he brings air and cheer into the sickroom, and often enough, though not so often as he wishes, brings healing.

Robert Louis Stevenson's
Classic Tribute to the Physician

LIFE AND DEATH IN THE MEDICAL PROFESSION*

By

FREDERICK L. HOFFMAN, LL.D.

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of America, Newark, N. J.

THE average doctor's life is hard. Physically, because of constant demands and exposure to every conceivable condition, it is probably the most trying professional pursuit. Intellectually, it is most exacting, because of its constant demands upon the mental faculties, due to the rapid progress in medical science, while, emotionally, it is harassing in the extreme, because of its pressure upon the sympathies and the conscience. Constantly confronted with questions of life, death and suffering, the doctor carries burdens often far beyond his strength. Socially, he knows little of freedom and leisure for human intercourse, because of the constant interruptions due to the doctor's calling, a servant ministering to the frailities of mankind. Economically, he is only too often heavily pressed by financial cares, since the average net yield of the doctor's calling is far from what it is often supposed to be.

1. Economic Status of Doctors

According to a report by Dr. R. G. Leland, of the American Medical Association, the average gross income of 6328 physicians in 1928 was $9764, ranging from $5289, during the first five years of practise, to a maximum of $11731, during the years from the fifteenth to the nineteenth of practise, after which the gross income declined to $4609, for fifty years of practise or more. These are gross incomes and therefore subject often to very substantial reductions before the net incomes are determined. But it is safe to assume that after taking all the facts into consideration the average net income of practising physicians throughout the country ranges between $5000 and $6000 per annum. The income is apparently at its best in surgery, Roentgenology and orthopedics. It is least in public health, tuberculosis, teaching and physical therapy. The doctor, in response to public opinion, is required to maintain a relatively high standard of life. Whether he wishes it or not, he must often live beyond his means to sustain the honor and the dignity of the profession. He must belong to several medical societies, social clubs, etc., must keep a car and attend conventions, all of which are additional burdens not common to many other professions. Hence, the stress and strain of the doctor's life unquestionably bear heavily upon his average duration of life and his powers of disease-resistance in chronic affections of adult life.

*An address delivered before The Eastern Medical Society, New York City, March 11, 1932.

2. Basic Facts of Longevity

A physician engaged in the healing art, with his thoughts concentrated upon his patients, has little time for himself or for the application of his knowledge to his own needs. Medical literature, unfortunately, is almost barren of useful discussions on the health problems and diseases of physicians, urgent as the necessity must appear to those who have given extended thought to the question. It is true that the *Journal of the American Medical Association* publishes annually a brief analysis of the causes of death in the medical profession, but this discussion is of small practical value and only of limited interest, in view of the unfortunate manner in which the data are presented. They are comparable from year to year with great difficulty and leave much to be desired in matters of detail. They start with a grievous statistical error, in that they are not a tabulation of deaths but rather a tabulation of causes of death, multiple causes being separately considered instead of being classified in accordance with international usage dealing with joint causes. How this works out in actual practise is not clearly deducible from the figures as published. In other words, the causes of death tabulated collectively represent a larger number than the actual number of deaths of physicians as determined by the published obituaries. This fallacy is clearly illustrated by reference to the returns published in the Mortality Statistics of the Census in 1925. In that year there were 1,219,019 deaths from all causes in the registration area, but these primary causes involved 536,901 contributory causes. If these two figures were added together and represented in a single analysis, they would lead to totally erroneous results as regards the prevalence of particular diseases. The manner in which they are tabulated in the census report is the only feasible one in dealing with joint causes, and is of the utmost importance for many practical reasons. For the statistics of the American Medical Association to be of practical and comparable value, they should be tabulated in accordance with international classification of causes of death and presented from year to year for a period of, say, five years, in a strictly comparable form, and, if possible, reduced to rates per 100,000 on the basis of the known number of physicians in the country. At the present time, they do not enable one to draw very useful conclusions, but I shall make the best of the material available.

3. Average Age at Death

The investigation starts with the average age at death, which, of course, is useful. This, for the year 1926, was 62.8 years, 62 years for 1927, 63.1 years for 1928, 64.9 years for 1929 and 63.7 years for 1930. *The data for 1931 are not yet available. These averages can not be compared with any known figures for other professions or occupations, for it would be grossly misleading to compare the average age at death for the

*During 1931 there were 2943 deaths reported by the *Journal of the American Medical Association*, at an average age of 63.8 years. From the issues of the *Journal* for the first eighteen weeks of 1932 I have abstracted 1031 obituary returns and found the average age at death to have been 63.9 years, ranging from an average of 60 years, during the week of April 23d, to 67.7 years, during the week of January 23d.

country at large, which includes women and children from birth onwards. In 1920, for example, which is the only year for which the data have been published by the census office, the average age at death for all ages from birth onwards was 42.5 years for both sexes, or 42.1 years for males only.

For some of the chronic diseases of adult life, the figures are fairly comparable, having been 60.7 years for cancer, 63.7 for cerebral hemorrhage and softening, 64.3 for organic diseases of the heart, 60.6 for cirrhosis of the liver, and 62.2 for acute and chronic nephritis. The ages at death are given by divisional periods of life, but certain data are missing for certain years, making a complete comparison difficult, but I have been furnished the missing data by the editor of the *Journal of the American Medical Association*, so that the following table is complete.

MORTALITY OF AMERICAN PHYSICIANS—AGES AT DEATH

Age	1926	1927	1928	1929	1930	1926-1930	Per Cent.
25–29	24	29	28	34	23	138	1.0
30–34	47	46	47	40	56	236	1.7
35–39	62	80	74	63	74	353	2.5
40–44	114	108	160	103	118	603	4.3
45–49	183	230	168	154	169	904	6.5
50–54	264	296	279	291	309	1,439	10.3
55–59	336	380	384	367	352	1,819	13.0
60–64	384	379	374	377	447	1,961	14.0
65–69	389	389	362	398	369	1,907	13.6
70–74	337	362	393	384	404	1,880	13.4
75–79	258	236	285	261	312	1,352	9.7
80–84	151	164	173	153	199	840	6.0
85 and over	128	91	118	109	110	556	4.0
Total	2677	2790	2845	2734	2942	13,988	100.0

4. Causes of Death

So far as this table can be relied upon, it suggests a slight tendency toward an increase in deaths at the older ages, or at seventy years and over, although this does not apply to age eighty-five and over, for the number of deaths in 1930 was less than in 1926. In other words, it is possible to draw only very general observations and conclusions from the data available. The causes of death as stated are not tabulated in accordance with international classifications and in their present form are not suitable for extended discussion. In other words, it is not possible to say with certainty whether the causes of death as enumerated are primary or contributory, so there is a small margin of error, which is most regrettable. This applies, for example, particularly to embolism and thrombosis, which, in many cases, are contributory causes instead of being primary. I give in the table below the data for certain leading causes of death, omitting, however, many of great interest, due to the very imperfect classification, since the data given in the text of the annual reviews of the *Journal* are not in tabular form, which is even more regrettable than other omissions.

Mortality of American Physicians—Causes of Death

	1926	1927	1928	1929	1930	1926-1930	Per Cent.
Typhoid fever	2	5	2	8	3	20	0.2
Influenza	61	30	44	90	17	242	1.8
Tuberculosis	70	75	91	75	59	370	2.8
Cancer	190	228	248	202	242	1,110	8.4
Diabetes	50	44	52	46	52	244	1.9
Cerebral hemorrhage	327	326	328	336	353	1,670	12.7
Diseases of the heart	782	851	884	902	1,059	4,478	34.0
Embolism and thrombosis	41	57	70	64	98	330	2.5
Arteriosclerosis	89	88	167	143	190	677	5.1
Pneumonia	303	259	272	362	269	1,465	11.1
Appendicitis	41	36	26	22	25	150	1.1
Cirrhosis of the liver	12	21	29	23	37	122	0.9
Nephritis	224	205	249	206	256	1,140	8.7
Septicæmia	39	21	20	31	50	161	1.2
Suicide	37	49	47	47	66	246	1.9
Homicide	9	14	12	10	6	51	0.4
Accidents	94	140	135	202	130	701	5.3
All causes	2371	2449	2676	2769	2912	13,177	100.0

This tabulation, regardless of its intrinsic defects, is of considerable interest. It shows, for example, that typhoid fever is of minor importance, in marked contrast to its outstanding position thirty years ago. Influenza shows seasonal variations from year to year, but tuberculosis shows a marked decline during 1930 compared with 1926. The leading cause of death was diseases of the heart, which shows a marked increase almost from year to year, followed by cerebral hemorrhage, which holds second place in the annual tabulations. In 1930 the third most important cause of death was pneumonia, the fourth nephritis and the fifth cancer. Cancer shows an increase in 1930 compared with 1926, but a slightly lesser number of deaths than was reported for 1928. Embolism and thrombosis have more than doubled during the five-year period, but this may possibly be the result of improved diagnosis or of more attention to contributory causes, although it is quite probable that these two affections have both increased correspondingly to the observed increase in the general population. Appendicitis shows a marked decline, from 41 deaths in 1926 to 25 deaths in 1930. Cirrhosis of the liver, to the contrary, has shown a marked increase, from 12 deaths in 1926 to 37 in 1930. There has been a slight increase in the mortality from nephritis, also from septicæmia, but a very marked increase in suicide, or, respectively, from 37 deaths in 1926 to 66 deaths in 1930.* Homicides are very much less common, but accidents show a substantial increase, from 94 deaths in 1926 to 130 deaths in 1930. It should have been pointed out that deaths from arteriosclerosis also show a marked increase, or from 89 deaths in 1926 to 190deaths in 1930. It is regrettable that these statistics cannot be precisely correlated to the number of physicians in actual practise.

*In 1931 the number of deaths from suicide in the medical profession was 64.

5. The Death Rate

The only extended and qualified discussion on the mortality of American physicians with which I am familiar is by Dr. Haven Emerson and Miss Harriet Hughes, of the DeLamar Institute of Public Health, Columbia University, published originally in the *American Journal of Public Health* of November, 1926. In this paper the death rate of physicians has been calculated for the long period 1902-1925, showing the lowest death-rate in 1903, or 13.73 per 1000, increasing gradually to 17.95 in 1923, diminishing to 17.22 in 1925. I have not attempted to calculate rates in view of the absence of entirely trustworthy basic information. · In the discussion referred to, the proportion of physicians of age 45 and over was calculated from 1890 onward, showing that in 1900 the proportion was 38.6 per cent., which had increased to 61.4 per cent. in 1925, showing conclusively that the average age of living physicians at the present time is possibly a number of years greater than formerly.

It is further pointed out in the discussion that it is evident "male physicians include a higher percentage of their entire number above the age of 45 years than do the other professional groups and to an ever greater degree than is the case among all occupied white males, and that this excess grouping in the later decades of life has increased rapidly within the past fifteen years." The number of white male physicians in the United States in 1925 is given as 134,361 and it is quite probable that the number at the present time is not less than 150,000.

The paper next compares the death-rates of white male physicians with those of all occupied white males for 1925. It is shown that while for physicians the death-rate was 4.9 per 1000 at ages 25-44, it was 7.06 for occupied white males; at ages 45-64, the rate for physicians was 16.5 per 1000 and for occupied white males 16.48; at ages 65 and over the rate for physicians was 73.4 per 1000 and for occupied white males 84.83. In other words, at ages under 45 and at 65 and over, the mortality of physicians was somewhat better, but not very much so, than the corresponding mortality of all white occupied males considered as a group.

6. Leading Causes

Apparently the original analysis of the causes of death was made at the office of the American Medical Association, so that it is reasonable to infer that the error previously pointed out in the published analysis from year to year was avoided, but of this I am not sure. Death-rates are given for white male physicians for 1925 and for the male white population 25 years and over for 1923. Organic diseases of the heart for these two periods show a death-rate of 363.9 per 100,000 for physicians against a rate of 301.0 for the white male population. For pneumonia, the death-rate for physicians was 165.9 against a general death-rate for white males of 121.8. For acute and chronic nephritis, the death-rate for physicians was 85.5 per 100,000 and for the male white population, 172.1. For violence, excluding suicide, the death-rate for physicians was 70.7 and that of the white male population 125.7, a marked differ-

ence. The rate for typhoid fever for physicians was 7.4 and for the white male population 7.0. For pulmonary tuberculosis, the rate for physicians was 35.0 and for the white male population 123.3. For other forms of tuberculosis, it was 4.5 for physicians and 10.2 for white male population. For cancer, it was 87 for physicians and 157.8 for white males, and for diabetes, it was 32 for physicians and 29.4 for white males.

7. Defective Sources

It is not feasible for me to enlarge upon the differences for the different age-periods tabulated by these authors. I quote, however, the following commentary of Dr. Emerson, which is highly significant: "A distressing commentary upon the character of professional attention given to physicians in their final illnesses, or at least upon the accuracy of certification of the cause of death, is the fact that of the 2544 deaths recorded for physicians in 1925, 432, or 16.9 per cent., were reported from ill-defined or undetermined causes. In New York City the per cent. of death certificates giving similar unsatisfactory causes of death in the general population in 1925 was 7 per cent., and in the registration area as a whole in 1923 it was 1.4 per cent." For this there is certainly no excuse and it may be looked upon as a defect in the method of securing the information by the American Medical Association rather than as a defect inherent in the local registration. Time and again, the obituary gives no specific cause of death, probably through failure to send out a supplementary letter of inquiry, which would bring out the information required, at least from the local boards of health. I quote the following final conclusion: "While there are minor exceptions in the three age-groups, the specific death-rates for organic heart diseases, pneumonia, and diabetes are decidedly higher among male white physicians in the United States than among the occupied males of the country as a whole. For chronic nephritis and Bright's disease, violence except suicide, typhoid fever, other forms of pulmonary tuberculosis, and cancer, the reverse is true. The lower rates among physicians are particularly marked under the categories violence other than suicide and tuberculosis in all forms." It is frankly admitted that this analysis is of small practical value, due primarily, no doubt, to lack of interest in the subject on the part of the physician, who should be primarily concerned with his own mortality, disease-resistance and health-conservation next to that of the patients treated.

8. Medical Centenarians

Thus, for example, an interesting study might have been made of the lives of physicians at the age of 90 and over. The obituaries frequently throw considerable light on questions of living-habits on the part of physicians of outstanding prominence that are well deserving of thoughtful consideration. In a recent letter in the *British Medical Journal*, for example, an amazing statement is made by the reviewer of Mr. Forbes Gray's book "Five Score," who expresses surprise that

"diligent search in many likely quarters" had failed to reveal more than one medical man who reached the hundred-year mark—Sir Henry Pitman. Dr. D. G. Crawford of Ealing, in commenting upon this statement, observes, "Many medical men must have passed the century. In the Bengal Medical Service, three men have done so in the past thirty-five years. As they were all medical officers of the Bengal army, the dates of their births and deaths have all been officially recorded." Two of these had put in full service of a quarter of a century or more in India, suggestive of the value of medical knowledge applied personally and to excellent purpose. It should not be difficult, by careful reading of medical biographies, to increase the number of known centenarians among physicians in England and elsewhere.*

9. Alcoholism and Suicide

In the *Journal of the American Association* for December 8, 1928, a letter dated London, November 10, 1928, has reference to an inaugural address to a course of "Industrial Diseases" by Dr. E. Graham Little, dermatologist and member of parliament for London University, who spoke on "The Health of the Medical Practitioner." He observes, in part, that "the decennial supplement to the registrar-general's report for England and Wales for 1921 furnished, perhaps for the first time, some reliable figures for occupational mortality. As compared with lawyers and with clergymen, the medical group has a much higher mortality. Two causes of death, which are, unhappily, notably frequent in physicians as compared with other groups, were alcoholism and suicide." I might have pointed out in my own analysis, which, however, is not quite complete, that there were seven deaths from alcoholism in 1930, one in 1929 and five in 1928, having already called attention to the increase in the mortality from cirrhosis of the liver, but how much of that is alcoholic cirrhosis is not known.

Quoting further from the address by Dr. Graham Little, it is said, "The physician, especially the physician practising in crowded industrial areas, is a much overworked man. He is often obliged to force himself to the utmost to get the last ounce of his strength brought into action in an emergency, and the peg of whisky is the quickest and most effective means of getting that last ounce of energy out of himself. In slum districts, the physician is usually an isolated, lonely and tired man. He is largely cut off from fellowship with his equals. The drabness of life is a factor in producing alcoholic habits."

I also quote the following interesting observation with reference to suicide: "The prevalence of suicide may, perhaps, be explained by a number of considerations. The physician who thinks he is attacked by a fatal disease may yield to a temptation to end his troubles, which is not present to other persons similarly affected, and the transitory or even momentary depression may thus precipitate a fatal issue. The means

*In its issue of February 20, 1932, the *Journal of the American Medical Association* makes mention of the death of Dr. Joseph R. Walker, of Rogersville, Tenn., who died at the age of 100 years. Unfortunately, the cause of death was not given.

of terminating his existence are always at his hand in the drugs which he handles. Also, the medical calling seems never so anxious a one as it is today. The profession is greatly overcrowded. Far from being the gold mine which popular imagination so fantistically imagines it to be, the consulting-room of a physician is much more often the shortest route to the cemetery." As pointed out in our own experience, there has been a lamentable increase in suicides during recent years, or from 37 in 1926 to 66 in 1930. For 1931 the figures will probably be still higher.

10. Tuberculosis and Respiratory Diseases

Coming now to other causes of death, Dr. Graham Little is quoted as having said: "The mortality-figure for tuberculosis in the medical group is lower than the class-figure would indicate, which is probably due to the open-air life which the average physician leads, and, perhaps, also to his greater respect for the rules of hygiene. On the other hand, the mortality-figure for pneumonia, for influenza, and for respiratory diseases (excluding bronchitis and tuberculosis) is exceptionally high. Pneumonia is one of the chief killing-diseases for the physician, ranking third in the list. This may be explained by diminished resistance, fatique and exposure." In our own experience, pneumonia also ranks as the third most important cause of death, but there was a slight lessening in the mortality in 1930 compared with 1926.

11. Diabetes and Appendicitis

In the English experience, high rates for physicians are also recorded in diabetes, digestive diseases and appendicitis, an incidence which may, perhaps, be explained by irregular habits in taking meals and in overeating after prolonged fast. This discussion by Dr. Graham Little was replied to by Dr. Alfred Cox, Medical Secretary to the British Medical Association, who said, in part: "I should not call it a drab life, I should call it the most interesting life there is. There is no drabness about it except to a man who finds himself in the wrong profession. It is an exaggeration to speak of the physician's consulting-room being the shortest route to the cemetery. The strain on a physician in an active practise is very great, both mentally and physically, but it must be remembered that a man cannot pursue a medical career unless he had good health to begin with. It is true that the temptation to alcohol is great in the case of the physician on account of missed meals, irregular working hours, and so forth. My own view is that, physically, physicians are as good as any other class. The life is a trying one, but I should not say that it is an especially easy road to the grave."

12. Comparative Mortality

To the foregoing views, Dr. Graham Little replied that "his views were based on official statistics, which show that, taking 1000 as the rate for all civilian occupied and retired males, the comparative mortality-rate (1021) of physicians as a group approaches the rate (1258) of the lowest

social class in our community—which includes unskilled and casual workers—and is actually higher than the figures for the four classes above that last aggregation of the most miserable of our people." This amazing conclusion was fairly well supported by the official statistics for 1921.

13. Early Observations

In this connection it may be of interest to recall the curious observations of Hufeland in his treatise on "The Prolongation of Life," of which the first edition was published in 1795. Hufeland speaks of doctors as having an average duration of life shorter than that of men in other professional or intellectual pursuits, drawing attention to the difficulties of medical men in observing the rules of health promulgated for the guidance of patients. He remarked that the strain of the profession and its effect on health and life are particularly severe during the first ten years of practise, after which he remarks that conditions tend to approach the normal in other pursuits. He points out that Hipocrates reached the age of 104, while Galen, Forestus, Hoffman and the Great Boerhave reached extreme old age.

14. Exceptional Individual Instances

It would be extremely interesting to bring these observations down to date. Recalling only a few of the names of outstanding physicians whom I have personally known, I may mention Sir William Osler, Sir Clifford Allbutt, Sir James Cameron, Sir James Mackenzie, Major-General Gorgas, Dr. Rodman, Dr. Theodor Tuffier, Dr. Henry C. Carter, Dr. Victor C. Vaughn, Dr. Goldberger, Dr. Walter Wyman, Dr. Isadore Dyer, Dr. Whartin, etc., all of whom died before the age of eighty, and many before even seventy years had been attained. I may also recall on this occasion the early death of Dr. Eugene L. Fiske, Medical Director of the Life Extension Institute, and the very recent death of my dear friend Dr. Aristdes Agramonte, whom, I am sure, had not attained his sixty-fifth year of age. I could easily enlarge this list of great names in medicine, but I will conclude by calling attention to the early death of Dr. Rosenau, an outstanding teacher of hygiene, Dr. W. Deeks, Medical Director of the United Fruit Company, and Dr. George M. Gould of Atlantic City, none of whom could have been seventy, certainly not seventy-five.

15. Dangers of Infection

Even more sad and still more depressing is the long list of medical men who have died in consequence of exposure to infection. I need only mention the lamented Dr. Noguchi, who died of yellow fever on the West Coast of Africa, to illustrate the dangers as well as the heroism of doctors in the line of duty. No tales of heroism can outmatch the records of medical men who, conscious of the risk, yet bravely face death with a stoicism worthy of the ancients. But most impressive are the deaths in early life of those who, disregarding obvious dangers, have

pursued the tortuous path of research and treatment in radiology. Could any heroism in every-day life exceed the dreadful suffering of those who went slowly to their grave in developing X-ray treatment or pursuing X-ray research. The advances of medicine in the field of preventible diseases have called for countless victims, from malaria to Texas cattle-fever, anthrax to Rocky Mountain spotty-fever, down to the latest of these affections, psitticosis.

16. Suicide

What underlying causes can account for these early deaths in the medical profession, for any death below the age of eighty must be considered the premature ending of a life potentially exceptionally favored to reach the extreme of human existence. Do they fall victims to their indifference to what they had been habitually preaching year after year to their patients or, because of the nature of the professional work, to the stress and strain of which I have called attention? I prefer to lean toward the latter explanation and consider the doctor's occupation as being one of the so-called dangerous trades. But consider for a moment the darkest phase of the subject, the self-destruction of physicians mostly in the prime of life. I recall, among others, the suicide of a brilliant health officer of one of our New England states. I think he had not reached the age of forty when he shot himself. I knew him well for many years and knew something of his high sense of duty and his strong inclination to brood over his professional difficulties. Yet his suicide remains to this day absolutely inexplicable. Then I recall the suicide of the Director of Research of a world-famous institution in London. His suicide also was never explained. I doubt if any group of men in medicine carry heavier burdens than those who pursue the difficult task of technical research, with its countless pitfalls and failures and few gratifying successes. I have shown that in 1930, out of 2943 deaths of American physicians, 66, or 2.2 per cent., committed suicide against 37 suicides in 2677 deaths, or 1.4 per cent., during 1926. In the English occupational experience of 1910-1912, there were 34 suicides in 1246 deaths, or 2.7 per cent., which may properly be contrasted with only 9 suicides in 2536 deaths of clergymen, priests, etc. It seems to me that the increase in suicides among physicians during 1930 and the high relative proportion in the total mortality cannot be looked upon otherwise than as due to stress and strain in the profession accentuated by the financial depression of the last two years.*

17. Diseases of the Heart

The leading cause of death in the American medical profession is diseases of the heart, with a strong tendency towards an increase during recent years. This accounts, in part, for the average age at death, which in 1930 was 63.4 years, and may be compared with an average age of 64.3

*In the English occupational mortality experience 1910-12, there were 1246 deaths of registered physicians from all causes, of which 34 were from suicide, or 2.7 per cent. In the 1920-22 experience, deaths from all causes numbered 1578, of which 35 were from suicide, or 2.2 per cent.

for heart diseases as returned by the census in 1920. But heart diseases considered as a group give a somewhat misleading impression, for the group includes many affections of a widely different degree of seriousness and relative importance. Sir James Mackenzie, the greatest authority on diseases of the heart and the arteries, born in 1853, died in 1925, or at the age of 72, from angina pectoris, a disease of which he had made a special study during most of his professional life. In the pathetic language of his biographer, Mr. R. M. Wilson, "He hid the knowledge [of the affection] in his heart and went on with his work." Could anything better emphasize what I have said of the sense of self-sacrifice and service common to the medical mind? Let those who wish to grasp this noble truth read the touching account of Sir James Mackenzie's life by R. M. Wilson, "The Beloved Physician," presenting in unostentatious language the heroic struggles against almost insurmountable difficulties and never-ceasing financial hardships possibly unsurpassed in the history of medicine. There is a most instructive chapter on "The Power to Foresee," and if ever a man was able to foresee the course and termination of a disease that man was Sir James Mackenzie. It goes without saying that he foresaw his own early demise, but, in the pursuit of his calling, he ignored the obvious lessons of his own condition. He ignored his own teaching that the first sign of fatigue or exhaustion in response to slight effort must be heeded, but who does heed it?

18. The Risk of Errors of Judgment

Medicine's most depressing aspect is the ever-present tragedy of fatal errors in diagnosis and treatment. The whole world gasped when some sixty-eight children in Luebeck, Germany, died in consequence of an error in the procedure of immunization against tuberculosis by the B C G virus of Calmette. Again, the world was horrified at the news that in Colombia a host of children had died as the result of an error in the procedure of immunization against diphtheria. In Luebeck the trial of the physicians concerned has been under way for three months and no judgment has as yet been rendered.* Cases are common in which doctors face the courts on one pretext or another, being charged with malpractice or gross errors in diagnosis or treatment. Countless tragedies of this kind, of course, never come to light, the knowledge being hidden in the doctor's heart. Under such circumstances, all a doctor can say and feel is that he has done his best, but that does not bring back the life wasted or sacrificed to ignorance or, for that matter, occasionally, to sheer physical weariness. Hence, it is no wonder that a doctor's life should, in many cases, terminate early as the result of the stress and the strain inseparable from the medical practise, and, especially, from that of the general practitioner. Hence, the importance of patient and sympathetic study of the facts concerning a doctor's life and death, which appears never to have been made.

*Since this was written the leading physician in the disaster has been found guilty and sentenced to fifteen months in prison.

19. War Service

No medical experience is more exacting or strenuous than that of war service. I am, fortunately, able to include in this discussion some authentic data regarding the World War, which I am sure will prove of particular interest. The information was obtained through the kindness of the Surgeon-General of the Army and of Lieut.-Col. Albert G. Love, Assistant. The time covered is from April, 1917, to December, 1919, so that the after-effects of the war in many cases must have been fatal.

20. War Mortality Experience

It appears that the total number of medical officers who were enrolled during the period of the World War, including 1455 contract surgeons, was 35,532. Among these there occurred 450 deaths. Of the total fatalities, 47 were killed in action, 27 died of wounds received in action, 101 died in the American Expeditionary Forces from diseases and non-battle injuries, and 240 died in the United States, Philippine Islands, Hawaii, Panama and Porto Rico from diseases and non-battle injuries. The causes of the 341 deaths from diseases and non-battle injuries were as follows:

Influenza and pneumonia	175	Typhoid fever	3
Meningitis, cerebrospinal epidemic	13	Angina pectoris and coronary diseases	6
Tuberculosis	13	Apoplexy	2
Organic diseases of the heart	12	Septic conditions	6
Malignant tumors	5	Other infectious diseases	2
Nephritis	4	Injuries	42
Appendicitis	4	Others and not stated	54

The foregoing table emphasizes the tremendous effect of influenza, the pandemic of which coincided with the war period. Otherwise, there are no striking examples, unless it be the comparatively slight incidence of all diseases other than cerebro-spinal meningitis, tuberculosis and organic diseases of the heart. Unfortunately, the return for injuries does not differentiate suicides, which, no doubt, occurred.

21. Gotha Life Insurance Company Experience

The first comprehensive and strictly qualified investigation of the mortality of physicians was made by the Gotha Life Insurance Company of Germany, under the direction of a Dr. A. Emminghaus, published in 1902 and covering the experience of the Company, 1829-1885. This, however, was preceded by an investigation by the same company into the causes of death of physicians covering the period 1829-1878, published in 1880. The earlier investigation is represented by 1140 deaths of physicians during the fifty-year period, analyzed by causes in accordance with a now obsolete classification. Passing over this study, I wish to draw attention to the admirable manner in which the later investigation was made. Unfortunately, the required brevity on this occasion precludes an extended analysis of these earlier results, which, however, were decidedly illuminating in emphasizing the relatively high mortality of doctors, particularly at the younger ages. There are references to the literature of the earlier mortality experiences of phy-

sicians, particularly a treatise by Dr. Casper, which was of some merit although limited to deaths alone. This is followed by a treatise by Dr. Gussman, who examined the mortality of physicians in Baden and Wurttenberg.

The analysis of causes of death in the Gotha experience showed a substantial excess in the death-rates of physicians from infectious diseases, particularly typhus, which, at the time, was, of course, quite common. The same conclusion applies to typhoid fever and abdominal typhus. The most important conclusion of the Gotha investigation was the excessive mortality of physicians at the time from diseases of the respiratory organs, excluding tuberculosis. The latter disease was more frequent among physicians at the earlier ages.

I will give the general results by causes of death for the entire period based on 1052 deaths, with 45,722 physicians exposed to risk one year. The general mortality rate was 23.0 per 1000 or, respectively, 10.25 at ages 26-45, 21.20 at ages 46-60, 67.13 at ages 61-90. There were 106 deaths from typhus and typhoid fever, 9 from spotted typhus, 9 from cholera, 8 from scarlet fever, 5 from muscular rheumatism, 6 from other infectious diseases, a total of 143, or at the rate of 3.13 per 1000 exposed to risk. Cases of poisoning produced 2 deaths from morphinism. Cancer caused 79 deaths, diabetes 7, gout 7, and other constitutional diseases 3, a total of 96 deaths, or at the rate of 2.10 per 1000 exposed to risk. Diseases of the brain caused 47 deaths, diseases of the spine 11, and other nervous diseases 3, a total of 61, equivalent to 1.33 per 1000 exposed to risk. For respiratory diseases, inflammation of the lungs caused 75 deaths, inflammation of the pleura 22, emphysema 48, and pulmonary tuberculosis 119, a total of 264, or at the rate of 5.77 per 1000.

Heart diseases caused 105 deaths, or at the rate of 2.34 per 1000, while digestive diseases caused 45 deaths, or at the rate of 0.96. Bright's disease caused 35 deaths, diseases of the bladder 21, a total of 56, or at the rate of 1.22. Suicide caused only 14 deaths and accidents 16, a total of 30, or at the rate of 0.66 per 1000. Apoplexy caused 166 deaths, or at the rate of 3.63, and old age, or senility, 76 deaths, or at the rate of 1.66 per 1000.

Without enlarging upon these results, which are given as a matter of historical interest, it may be pointed out that no such study has ever been made of American physicians, urgently as this is demanded by the existing facts of the situation.

22. Early British Investigations

The next most important investigation of an early period was made by Dr. F. G. Neison, published in London, in 1857, in his contribution to vital statistics, in which he included a chapter on the rate of mortality in the medical profession. This, unfortunately, includes no observations on the causes of death, but deals in a qualified manner with the observed experience of the officers of the medical department of the Royal Army and of the members of the Royal Medical Chirurgical Society, covering the period 1816-1851. In the order of historical

importance, this investigation should perhaps have been considered first. It includes observations on 15,567 physicians exposed to risk one year, and 386 deaths. It is suggestive of a corresponding investigation being made of the mortality experience of the American College of Surgeons, for which the facts would certainly be readily available, needing expert actuarial experience to provide an extremely interesting contribution to mortality studies. It might likewise be possible to work out such an investigation on the basis of the medical register and the recorded deaths in the *Journal of the American Medical Association* from year to year. The Neison investigation shows a remarkably high and impressive mortality among physicians at the younger ages, gradually diminishing by age forty, after which the medical experience is apparently very much more favorable. I cannot enlarge upon this interesting investigation, which, however, should be taken into consideration in any comprehensive account of the subject.*

I can only refer here to an interesting paper by Dr. A. Guy "On the Duration of Life among Medical Men," published in the *Journal of the Royal Statistical Society*, Volume XVII (1854), page 15. About 850 deaths among the medical profession for the years 1758-1852 were considered in this article. Another but smaller article by Dr. Guy was published in the *Journal of the British Association for the Advancement of Science* for 1846 (Statistical Section). This article, called "On the Duration of Life in the Members of the Several Professions," considered the deaths of 260 medical men.

23. Recent British Data

Of more recent date, and statistically much more valuable, are the returns of the Registrar-General as appended to the 75th Annual Report, for the years 1910-1912, and the 85th Annual Report, for 1920-1923. The first of these reports gives an analysis of 1246 deaths of physicians, surgeons and registered practitioners derived from a census population of 73,659 individuals exposed to risk for the three-year period. The principal causes of death in this group were as follows:

PRINCIPAL CAUSES OF DEATH AMONG PHYSICIANS, SURGEONS AND REGISTERED PRACTITIONERS, ENGLAND AND WALES—1910-1912

Circulatory system	253	Other diseases of the urinary system	36
Cancer	126	Diabetes	21
Pneumonia	99	Alcoholism	5
Cerebral hemorrhage	78	Insanity	2
Pulmonary tuberculosis	73	Hernia	1
Cirrhosis of the liver	27	Suicide	34
Other diseases of the digestive system	78	Accidents	30
Acute and chronic nephritis	94	Other causes	152

The report gives the death-rate per 1000 at different periods of life, which, however, for the present purpose, are compared with the corresponding death-rates for clergymen, priests, ministers and barristers and solicitors.

*See also article "On the Rate of Mortality of the Medical Profession," by Neison, Volume XV (1852), pages 193 to 222, of the *Journal of the Royal Statistical Society*.

Comparative Death-Rates, 1910-1912, England and Wales
Rates per 1,000

Age	Physicians	Clergmen	Barristers
20–24	4.3	1.3	1.6
25–34	3.7	2.2	3.2
35–44	7.0	3.2	5.7
45–54	13.8	7.6	12.0
55–64	26.1	21.9	26.0
65–74	57.1	50.5	52.0
75 and over	146.3	137.9	149.8

Required brevity precludes extended observations on these statistics. which, however, visualize the correct method of approach to the question of comparative mortality in the medical and other professions.

The corresponding data for 1920-1923 concerns 1578 deaths among registered medical practitioners with a collective population for the three years of 76,719. The principal causes of death were as follows:

Principal Causes of Death among Registered Medical Practitioners, England and Wales—1920-1923

Other heart disease	152	Ulcer of the duodenum	7
Arteriosclerosis	124	Appendicitis	14
Influenza	61	Hernia	2
Pulmonary tuberculosis	61	Intestinal obstruction	10
Cancer	180	Cirrhosis of the liver	23
Diabetes	33	Acute and chronic nephritis	82
Alcoholism	1	Disease of the prostate	32
Cerebral hemorrhage	129	Other genito-urinary diseases	23
Bronchitis	47	Old age	59
Pneumonia	140	Suicide	35
Ulcer of the stomach	12	Accidents	59

The comparative death-rates per 1000 by divisional periods of life compared with those of clergymen and barristers and solicitors were as follows:

Comparative Death-Rates, 1920-1923, England and Wales
Rates per 1,000

Age	Medical Practitioners	Clergmen Church of England	Barristers
20–24	4.96	...	9.80
25–34	3.57	1.98	4.62
35–44	5.77	3.95	7.67
45–54	12.25	6.48	12.42
55–64	26.51	16.20	25.95
65–74	44.89	41.63	43.14
75 and over	109.86	100.19	116.41

24. Mortality of German Physicians

In connection with the foregoing, I must refer briefly to a discussion on "Longevity Among Physicians in the Medical World," a German publication, of June 14, 1930. This paper makes a reference to a discussion of the subject by Rehn on the occasion of the last German

Surgical Congress on The Mortality of Surgeons, according to which, in the sixth decade of life, the death-rate was four times as high as among the population at large. But this statement was apparently not well substantiated by the statistics in question. There is a further reference to a discussion on the subject by H. Romanelli on the occasion of the Seventh International Congress for Social Medicine, held in Naples the preceding year. This author presents a discussion based on data furnished by the National Institute for Social Insurance based on insured physicians, with the total number of insured under the social insurance system of Italy. Here, again, the statistical method was faulty and the conclusions are open to question. The statement is made that the mortality of physicians at age sixty and over represents 17 per cent. of all deaths, against 32.7 per cent. in the general population. But it is difficult to draw conclusions from such observations. The analysis of the causes of death was based on 419 cases, but that is too small a number for definite conclusions. I have not seen this paper in the original so I cannot deal with it critically.

25. Comparative Causes of Death

Reference is made to the higher incidence of influenza among physicians, giving a comparative mortality figure of 8.8 against 6.5 in the general population. Diseases of the heart and circulatory system are represented by 28.9 for insured physicians, against 22.11 for the general population. But the mortality from cancer is lower, or 7.9 against 8.94 for all insured. Diseases of the kidneys give a figure of 7.6, against 4.86. Tuberculosis of the lungs show a figure of 2.9, against 9.99 in the general population, but broncho-pneumonia shows a figure of 5.2, against 4.23, and other forms of pneumonia 4.5, against 3.55. Typhoid and malaria fevers are about the same, or 2.6 against 2.69. Suicide occurred at the rate of only 1.9 for physicians, against 3.39 for the general population. I give these figures as I find them without critical comment. The chief conclusion advanced is that physicians, in consequence of exposure, are more liable to infection, which, of course, is natural.

The author draws particular attention to differences in the mortality from pulmonary tuberculosis, malignant tumors and diseases of the circulatory organs. In the last named, insured physicians, it is pointed out, had an extremely unfavorable position. The lower mortality from malignant tumors was unexplained. The author refers to statistics published by the Metropolitan, according to which physicians experienced a shorter duration of life than did the population at large, estimated at about two years. I have not been able to give these observations extended consideration for want of access to the original material, but it is highly suggestive of further study, somewhat difficult on account of the manner in which the conclusions are presented. Of particular interest, however, are certain conclusions regarding individual longevity, from which I give the following: Robert Koch died at the age of 67; Charcot, 68; Billroth, 65; Behring, 64; Auenbrugger, the discoverer of auscultation and percussion, 87; Laennec, 46. Among

anatomists, he quoted higher ages or, Morgagni, 90; Pouport, 82. Among surgeons, he refers to Cuyon, who died at the age of 90, Esmarch, at 86, and Lister, at 85.

26. Mortality From Cancer

It remains for me only to mention briefly the recent discussion by Dr. Walter C. Alvarez in the *Journal of the American Medical Association* of July 11, 1931, in which there is an analysis of 41 consecutive case-histories of cancer of the stomach among physicians treated at the Mayo Clinic. The number of cases, however, is too small for safe conclusions, except that physicians in many instances were guilty of indifference to early symptoms, which, if properly heeded, might have postponed death. It is regrettable that these observations should not rest upon a larger range of individual instances.

Important observations regarding the relative incidence of cancer in the medical profession are contained in a special report on "An Investigation Into the Statistics of Cancer in Different Trades and Professions," published by the Medical Research Council, London, 1926. According to this study, which is probably the most comprehensive ever made, the conparative mortality figure for all forms of cancer for physicians and surgeons was 70, against a figure of 45 for clergymen and priests, 77 for barristers, 57 for teachers, and 58 for farmers, etc. The standardized death-rate per 1000 for cancer of the stomach was 0.161 for physicians and surgeons, compared with 0.349 for clergymen and priests, 2.06 for barristers, 3.83 for teachers, and 0.551 for farmers, etc. The need for brevity precludes more extended consideration.*

27. Summary of Observations and Conclusions

When I set out on the preparation of this dissertation on "Life and Death in the Medical Profession," I had hopes of being able to present the subject in a more finished and practically useful form, reflecting the results of medical learning and experience in the age-long effort to prolong the duration of human life, for it is in the lives of physicians and surgeons that we should find the answer to many of the most pressing questions that demand a solution. But the results, to my regret, are mostly negative. Medical men, in spite of their better knowledge and the immense benefits to mankind in the cure of sickness and the alleviation of pain, are themselves not benefited to the extraordinary degree as would naturally be expected. The death-rate of medical men is shown not to vary much from that of other professional pursuits, while it certainly falls below that of clergymen. Even the great Sir William Osler lived only to three-score and ten. Yet few men knew better the principles of rational life-prolongation, and few have lived a life more intelligently adapted to secure this end. It was my priceless privilege to revisit Sir William, at his home in Oxford, just a few weeks before he

*In the English occupational mortality experience of 1910-12 the number of deaths of registered physicians from all causes was 1246, of which 126 were from cancer, or 10.8 per cent. In the 1920-22 experience there were 1578 deaths from all causes, of which 180 were from cancer, or 11.2 per cent.

passed away. He was apparently in excellently good health and, as ever; the great medical philosopher and friend. But he had lived a strenuous life and his spirit was crushed by the death of his only son in the World War. His mentality was as vigorous as ever and he was full of ambition for the future. In his early death the world lost one of its most priceless possessions, and it has been thus with many other masters of medicine and surgery. Hence, my suggestion on this occasion to initiate a thorough study of the problem of longevity in its special application to the medical profession. I feel strongly that a study of the lives, the habits and the recreations of, say, one thousand men of mark in the medical world for the last quarter of a century would make an extremely valuable contribution to knowledge. And this study should be amplified by research into all the more promising studies thus far made into the cause of death in the medical profession in this and other countries, with due regard to ages at death and the lessons to be learned from the countless instances of premature demise. Let guesswork and crude speculation be replaced by an authentic study of the salient facts, for it goes without saying that the nation suffers no greater social losses than that of the wasted years of life in the part of its medical men who die many years in advance of their attainable time.

No career presents more strenuous mental effort, more exacting demands upon time, more sacrifice of means, more foregone leisure, than that of the doctor who takes his work seriously, and there are few who do not. No class of men renders a greater and more indispensable service to society than those who practise the art of medicine, in all its branches and selected specialties. Upon no group of men falls a heavier burden or a greater responsibility in peace and in war. And none has done more to advance the cause of a true civilization, in which the blessing of a long life and freedom from illness and suffering is made the supreme test of its attainment on the part of an ever-increasing proportion of mankind. Yet, as I have shown, the evidence regarding its own health and longevity is decidedly disconcerting, while suggestive of neglect that justifies the inquiry suggested.*

Summarizing the foregoing rather sketchy observations, it seems to me that the subject is one which should demand much more qualified and extended consideration, and that a thorough study of the whole question of the causes of death in the medical profession, the average duration of life, and the rates per 1000 compared with those of other professions, would make an extremely valuable contribution to medical knowledge.

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*See in this connection the highly illuminating address on "Keeping the Doctor up to Date," by Dr. Ray Lyman Wilbur, Secretary of the Interior, in the *Journal of the American Medical Association*, April 2, 1932.

APPENDIX A

Mortality of Registered Physicians in England and Wales, 1920-22

Valuable data on the mortality of medical men are contained in the decennial supplements to the reports of the Registrar-General of England and Wales for a long period of years. The latest of these reports is for the three years 1920-1922, representing an analysis of 1578 deaths during the three years. The report cannot be dealt with in very much detail on this occasion, but certain important conclusions may be given. The ratio of mortality of registered physicians in England and Wales to that of all occupied civilian males, taken as one hundred for certain age-periods, has been as follows: For the age-period 20-24, the ratio was 141; 25-34, 88; 35-44, 90; 45-54, 106; 55-64, 103; 65-69, 90; 70 and over, 81. Thus, the mortality of physicians was above the average at ages 20-24, 45-54 and 55-64, and below the average at other ages.

The mean annual death-rate was 496 per 100,000 at ages 20-24, 357 at ages 25-34, 577 at 35-44, 525 at 45-54, 2651 at 55-64, 4489 at 65-69 and 10,986 at 70 and over. These figures are compared with a few other professional occupations in the table below.

Comparative Mortality of Physicians and of Other Professions, England and Wales, 1920-1922. Rate per 100,000.

Age	Registered Physicians	Teachers	Protestant Clergymen	Civil Service Officials
20–24	496	492	—	215
25–34	357	292	198	305
35–44	577	408	395	411
45–54	1225	726	648	878
55–64	2651	1970	1620	1998
65–69	4489	4081	4163	3779
70 and over	10986	10612	10019	10663

I give below the death-rates per 100,000 for registered physicians, teachers, Protestant clergymen and civil-service officials from pulmonary tuberculosis, cancer, valvular heart-disease, pneumonia and chronic nephritis, as reported in the British occupational mortality experience 1920-22.

Registered Physicians

Age	Pulmonary Tuberculosis	Cancer	Valvular Heart Disease	Pneumonia	Chronic Nephritis
20–24	—	—	—	83	—
25–34	54	—	—	47	—
35–44	96	12	18	72	36
45–54	74	143	30	211	49
55–64	111	431	105	191	172
65–69	47	605	256	372	233
70 and over	59	1045	513	611	414

TEACHERS

Age	Pulmonary Tuberculosis	Cancer	Valvular Heart Disease	Pneumonia	Chronic Nephritis
20–24	193	21	11	21	21
25–34	83	10	7	24	10
35–44	77	32	16	39	13
45–54	83	119	32	45	11
55–64	64	367	150	107	92
65–69	98	686	380	196	233
70 and over	60	1042	719	359	228

PROTESTANT CLERGYMEN

Age	Pulmonary Tuberculosis	Cancer	Valvular Heart Disease	Pneumonia	Chronic Nephritis
20–24	—	—	—	—	—
25–34	53	13	—	13	13
35–44	64	35	14	64	14
45–54	52	63	23	52	46
55–64	52	263	103	92	52
65–69	62	608	234	234	234
70 and over	21	853	453	369	453

CIVIL-SERVICE OFFICIAIS

Age	Pulmonary Tuberculosis	Cancer	Valvular Heart Disease	Pneumonia	Chronic Nephritis
20–24	113	3	3	21	3
25–34	124	5	12	19	4
35–44	120	24	15	23	12
45–54	126	149	51	65	32
55–64	95	436	156	103	92
65–69	61	664	276	153	174
70 and over	43	1242	528	400	408

APPENDIX B

List of References

PROBABLE DURATION OF HUMAN LIFE.
Professor Casper, Berlin, 1835. (This seems to be the first qualified study of the subject in print.)

MEDICAL CORRESPONDENCE OF WURTTENBERG PHYSICIANS.
Dr. Konig, Stuttgart, 1839.

TREATISE ON THE MORTALITY OF PHYSICIANS.
Professor Casper, Berlin, 1846.

CANCER IN THE MEDICAL PROFESSION—CONTRIBUTION TO VITAL STATISTICS.
F. G. Neison, London, 1857. (On the rate of mortality in the medical profession, one of the most exhaustive and important studies of its kind, including life tables and other data, but no reference to causes of death.)

ON THE DURATION OF LIFE IN SEVERAL PROFESSIONS.
Dr. Guy, *Journal of the Royal Statistical Society*, Volume IX, London, 18__.

ON THE DURATION OF LIFE AMONG MEDICAL MEN.
Dr. Guy, *Journal of the Royal Statistical Society*, Volume XVII, London, 1854.

STATISTICAL INVESTIGATIONS REGARDING THE MORTALITY SITUATION IN THE MEDICAL PROFESSION.
E. Gussman, Stuttgart, 1865.

MORTALITY DATA ON MEDICAL MEN.
Published in Contributions to Mortality Statistics of the Life Insurance Company of Gotha, 1829-1878, by Dr. Emminghaus, Weimar, 1880 (in German).

OBSERVATIONS ON THE MEDICAL PROFESSION.
Paper by Dr. Ogle on the Occupational Diseases, *Journal of the Royal Medical and Chirurgical Society*, Volume LXIX, London, 1886.

MORTALITY AND LONGEVITY OF PHYSICIANS OF SAXONY.
Von Geissler, Leipzig, 1887.

THE MORTALITY FROM TUBERCULOSIS ACCORDING TO OCCUPATIONS IN SWITZERLAND.
Journal of the Swiss Statistical Society, 1887.

THE HYGIENE DISEASES AND MORTALITY OF OCCUPATIONS.
Dr. J. T. Arlidge, London, 1892. (Mortality of medical men, derived chiefly from the decennial supplements of the Registrar-General of England and Wales.)

MORTALITY, LONGEVITY AND CAUSES OF DEATH AMONG DOCTORS IN WURTTENBERG, 1810-1895.
Dr. W. Weinberg, Stuttgart, 1897, in German. (This unquestionably is the most important paper of its kind on the mortality in the medical professions, including a wealth of data and historical references to other investigations.)

INSURANCE AND MEDICAL STATISTICS IN THE EXPERIENCE OF THE GOTHA LIFE INSURANCE COMPANY.
Professor Karup, Dr. Gollmer and Dr. Florschutz, 1902, in German. (Mortality data of medical profession including life tables and causes of death.)

DEATHS OF INSURED PHYSICIANS FROM SEPTIC POISONING FROM PATIENTS' COUGHING.
Journal of the American Medical Association, December 9, 1922.

DEATH-RATES OF MALE WHITE PHYSICIANS IN THE UNITED STATES BY AGE AND CAUSE.
Dr. Haven Emerson and Harriet Hughes, *American Journal of Public Health*, November, 1926.

THE HEALTH OF THE PHYSICIAN.
London Correspondent, *Journal of the American Medical Association*, December 8, 1928.

ARE PHYSICIANS LONG-LIVED?
Statistical Bulletin, Metropolitan Life Insurance Company, June, 1929.

AVERAGE DURATION OF LIFE OF PHYSICIANS.
Dr. E. Furth, Med. Welt., Volume 4, June 14, 1930, page 868.

INCOME FROM MEDICAL PRACTICE.
R. J. Leland, M. D., *Journal of the American Medical Association*, May 16, 1931.

HISTORY OF 41 CASES OF CANCER OF THE STOMACH IN PHYSICIANS.
Dr. W. C. Alvarez, *Journal of the American Medical Association*, July 11, 1931.

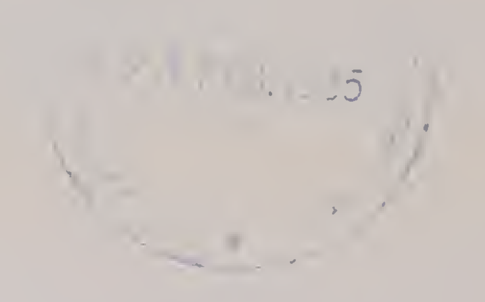
THE PRACTICE OF MEDICINE AS A PROBLEM IN INDUSTRIAL HYGIENE.
Journal of the American Medical Association, August 31, 1931.

MEDICAL CENTENARIANS.
Dr. D. G. Crawford, *British Medical Journal*, January 16, 1932.

THE OCCUPATIONAL DISEASES OF PHYSICIANS.
Dr. Antal, *Journal of the American Association*, March 12, 1932.

Regular Issues of the *Journal of the American Medical Association*, containing editorial observations on the causes of death in the American medical profession.

Decennial Supplements of the 45th 55th, 65th and 75th annual reports of the Registrar-General of England and Wales, London, England. (These reports contain the most authentic data on the subject and deserve to be studied with painstaking care from decade to decade, as reflecting mortality, important changes that have taken place in mortality, and disease-liability of physicians and surgeons.





INTERNATIONAL ASSOCIATION for SOCIAL PROGRESS (British Section)

REPORT

ON

"The Effects Upon Labour of Modern Industrial Developments."

LONDON:
CO-OPERATIVE PRINTING SOCIETY LTD., TUDOR STREET, NEW BRIDGE STREET
and at Manchester and Newcastle—1026.

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1927

This report was prepared by a Sub-Committee of the British Section of the International Association for Social Progress for the Annual Congress held in Vienna, 1927.

The Sub-Committee consisted of :—

Dr. C. S. MYERS, C.B.E. (Chairman), National Institute of Industrial Psychology.

Dr. P. SARGANT FLORENCE (Convener) Cambridge University.

Mr. ERNEST BEVIN, Transport Workers.

Professor H. CLAY, Manchester University.

Mr. H. H. ELVIN, National Union of Clerks.

Captain L. H. GREEN, Flour Milling Employers' Federation.

Lady HALL, Hon. Sec., British Section, I.A.S.P.

Major J. W. HILLS, M.P., Chairman of the British Section.

Mr. J. KELLY, M.P., Workers' Union.

Dr. C. H. NORTHCOTT, Messrs. Rowntree.

Mr. CHARLES RENOLD, Hans Renold, Ltd.

Mr. A. H. SMETHURST, Amalgamated Engineering Union.

Miss CONSTANCE SMITH, O.B.E.

Mr. F. D. STUART.

Dr. H. M. VERNON, Magdalen College, Oxford.

Mr. D. R. WILSON, Industrial Fatigue Research Board.

Report of the British Sub-Committee on the Effects Upon Labour of Modern Industrial Developments

I.

The International Association for Social Progress laid down as the subject for this investigation "The Social Effects of Rationalisation." The British Sub-Committee have substituted the wording "The Effects upon Labour of Modern Industrial Developments." The Committee feel that the word "social" has too wide a connotation in English for any useful purpose. They assume the terms of reference to have application to the working-classes, and have, therefore, used the phrase "effects upon labour" in place of "social effects." They understand that this implies a restriction of the scope of their investigations to that side of the workman's life connected with production. The question as to how he is affected as a consumer will not be considered.

To the word "rationalisation" the Committee have even greater objections. It is even less idiomatic English than the word "social." Moreover, it has quite a recognised meaning in psychology as the explaining away, by a plausible reason, of what one has done when the deed was really performed instinctively or impulsively. It was suggested that the phrase "scientific management" should be used as its equivalent. To this there were several objections :—

(a) There is little scientific management in Great Britain in the sense of Taylorism. The early mistakes of Taylorism and the rooted objections to it of Trade Unions have made this type of scientific management impossible in Great Britain.

(b) The term "scientific management" is too narrow an interpretation of what seems to be the meaning of rationalisation. In Germany, where the word has gained greater currency, it has been defined by the "Reichskuratorium für Wirtschaftlichkeit" as the increase of national welfare by a fall in prices, rise in quantity and improvement in quality of disposable products. In this sense it is nothing new, being an attempt on the part of business men to do what the economist has always implied they were doing, namely, thinking how to be efficient ; how to maximise production at a minimum of cost ; and how to eliminate waste.

(c) An effective answer from Great Britain must cover what this country has done. It has not accepted the American idea of scientific management, but it has continued in its own way to increase industrial efficiency. A number of developments, often

unco-ordinated, have been taking place in Great Britain over the last 15 to 20 years. Some of these run parallel with the American idea of scientific management in that they include the application of ideas concerning organisation. Of these last probably the most important is the development towards functionalisation, in the sense of the allocation of specific functions, common to all or several departments of an establishment, to a man specially qualified to control and organise this particular function. At the same time there has been a development of what will be later described as " democratisation," and a most significant extension of the use of psychology in industry that will also be dealt with later.

These reasons have led the British Sub-Committee to use the phrase " modern industrial developments " in place of the term " rationalisation." The full title of the report which they present thus becomes " The Effects upon Labour of Modern Industrial Developments."

The Sub-Committee, by reason of its personnel, is in a position to appreciate the tendencies in British industry and the extent to which modern industrial developments have gone. But it must be noted that this report is not based upon a precise and quantitative statement of the extent to which British industry has adopted modern ideas, nor can it be interpreted as an accurate reflex of the tendencies in British industry generally. It would be more correct to say that the report reflects the experience gained by enterprising firms who introduced these modern ideas under somewhat favourable circumstances, and indicates how dangers which are possibly inherent in such developments may be forestalled.

To obtain definite statements from firms of this type, the Sub-Committee decided to circulate a questionnaire containing ten specific questions. The replies received are summarised in the body of the report. In some instances these replies have been interpreted by the Sub-Committee in the light of their own personal knowledge of British industry. To some extent, therefore, the report is the Committee's own estimate of some tendencies in British industry, supplemented and documented by the replies to the questionnaire issued.

QUESTIONNAIRE ON THE EFFECTS IN GREAT BRITAIN OF MODERN DEVELOPMENTS IN INDUSTRIAL ORGANISATION.

1. If you have increased the proportion of work done by machines or by other mechanical contrivances (a) Has this led to the discharge of men from your factory ? (b) Have those that remained in employment increased their earnings ?
2. If you have standardised your processes, have you to any extent reduced the demand for skill in your trade ? Has standardisation or sub-division of processes led to any complaints that work has become monotonous or uninteresting ?

3. If you have developed statistical records or cost sheets that help to measure (a) the efficiency of management, (b) the efficiency of labour, could you indicate what particular records you have found most useful, and to what extent you have explained or exhibited any of these to your employees ?

4. If you use any statistical services to help you in forecasting market conditions, or if you have adopted any methods of planning so as to regularise production over the different seasons or years, to what extent have these measures been successful in stabilising employment ?

5. If you have adopted any form of payment by results, what opposition, if any, did your proposals meet with from your workers ? What has been the effect on earnings, quality of work, safety, and costs, and what is the present attitude of your workers ?

6. If you have adopted time study, would you be willing to describe your method ? What steps, if any, did you take to carry your workers with you in its adoption ? What results have you obtained (a) in output ; (b) in the confidence of your workers ?

7. If you have adopted any of the following measures either to increase output or to ease strain : motion study, selection of workers by vocational tests, rest pauses, special appliances for facilitating ease of work ; what appreciable results have you obtained in respect of (a) correct placing of workers ; (b) labour turnover ; (c) quantity and quality of output ; (d) wages ; (e) confidence ; (f) any other factor.

8. If you have adopted wholly or in part either the " staff " or the functional type of organisation ; would you be willing to give a concise but complete account ? Have you carried any such changes " down the line," altering in any way the powers and responsibilities of foremen ? What effects have any such changes had upon the tone and efficiency of workrooms ? Have they received either the tacit or open approval of your employees ?

9. Have you any machinery for facilitating discussion between managers and workers ? If so, has this given the workers any share in management ? Could you describe what specific matters are dealt with in this way ?

10. If you have made any arrangement or agreements with other firms for eliminating excessive competition or avoiding over-production (e.g., by concentration on the most efficient plant, by working short-time, etc.), could you specify the effects you expect these arrangements to have on the volume and stability of employment, on wages, or in any other way ?

The British Sub-Committee wished to investigate the results of specific developments undertaken as a means to efficiency rather than " rationalisation " as a whole. Each of these questions relates to some definite development either in methods of performing or paying labour, or in the management of individual forms, or in the organisation of whole industries.

Questions 5, 6, and 7 concerning time study, payment by results, and policies associated with industrial psychology may be classed as questions of the science of labour, including as they do what Dr. Frederick Taylor used to call the science of hand wisdom and the technical devices of his "scientific management," together with the broader and more truly scientific methods for easing strain and increasing the efficiency of labour.

Questions 1, 2, 3, 4, 8, and 9 may be classed as questions relating to the science of management of individual firms. Each development may for convenience be referred to by a single word as (1) mechanisation, (2) standardisation, (3) statisticalisation, (4) stabilisation, (8) functionalisation, (9) democratisation.

Standardisation and stabilisation are specifically mentioned by Mr. Houston in his memorandum to the Economic Conference of the League of Nations on **Rationalisation in the United States**, and he refers also to the collection "of a body of industrial statistics which showed the possibilities of control in a proper use of statistics." This passage and also a further reference to "a vast body of statistical information which is really being used as it never was before the war to guide the policies of individual concerns, and thereby frequently of the major portions of single industries" justify us in including the process of "statisticalisation."

Mechanisation may perhaps be considered an old story, but it is important to realise that the substitution of machinery for hand labour is not a closed chapter, and that rationalisation is in this respect simply a further instalment of the so-called industrial revolution of the 19th century.

Functionalisation formed a definite part of the programme of scientific management outlined by Frederick Taylor and involves extending to the hierarchy of management the principle of the division of labour introduced by the industrial revolution. It is unquestionably an important modern development of the science of management.

The inclusion of democratisation among specific measures of rationalisation is more open to question. But the Sub-Committee considered that the effects upon labour of modern developments must to a large extent depend on the degree to which labour is consulted beforehand, and that it is of the utmost importance to find out how far democratic methods of management accompany the process of rationalisation.

Under the heading of the science of "organisation" would fall all questions affecting a whole industry rather than individual firms within the industry. The only question throwing light on this side of rationalisation is No. 10, dealing with possible agreements between firms in the same industry. The answers to this question were not satisfactory and it must be concluded that little direct evidence is obtainable on this score from the method of questioning individual employers. Our investigation therefore is chiefly one of modern developments introduced by **individual firms** and the effect of these upon the labour employed by them.

II.—SOURCES OF INFORMATION.

The number of firms returning full answers to our questionnaire was 16. They were distributed over nine different industries, namely : four in the confectionery industry ; two in textiles ; two in chemicals ; two in engineering ; and one each engaged in the tin-plate, printing, pottery, gas, food and milk distribution industries respectively. We may refer to most of these firms by name, but a few stated that they wished to remain anonymous. Those that can be named are : Messrs. Rowntree and James Pascall, in the confectionery industry ; the Shredded Wheat Company in the food industry ; Messrs Arthur H. Lee and Sons, manufacturing power-made tapestries and hand embroideries ; Mander Brothers (Varnish and Paint Works), and Howard and Sons in the chemical industry ; Electric Control Limited and Hans Renold Limited in engineering ; J. Wedgwood and Sons, pottery works ; the South Metropolitan Gas Co. ; United Dairies Limited ; Hazell, Watson and Viney Limited, printers and binders ; and the Melingriffith Company Limited, tin-plate manufacturers. The firms who wish to remain anonymous we shall refer to as " the other " Chocolate Factory, a Sweet Factory, and the (two) Knitting Yarn Mills, who reported as one.

The firms to whom the questionnaire was sent are not to be regarded as representative of British industry as a whole. They were selected as model firms likely to have introduced modern developments, and as a matter of fact most of those sending replies were found to agree in reporting payments by result, statistical records, functionalisation and some measures of industrial psychology. Most of these were found to be making an increasing use of machines and mechanical contrivances. Standardisation, in the sense of reduction in the variety of patterns and qualities of product was, however, by no means universal and the replies to all our questions brought out some notable differences both in the extent to which the developments in question had proceeded in various directions and in the effects upon labour. We propose therefore to consider the answers to each of the questions in turn.

III.—SUMMARY OF ANSWERS TO QUESTIONNAIRE.

1. Mechanisation.

Most of the employers replying were, in practice, substituting machine work for hand work wherever possible, and in their experience had not found that unemployment resulted. The labour displaced from the hand processes was said to be absorbed on machine work by reason of the increased output from the machines ; and usually the wages of the machine workers were slightly higher than those of hand workers.

Many of the firms replying pursued a deliberate policy of absorbing the workers that machinery displaced by transferring them to other departments where the work would be increased through the additional output of the machines. Other firms did not state whether the

individuals displaced were immediately transferred and it is possible that though the total number employed remained the same, the two totals were composed of different persons. In that case some of the old employees would be suffering unemployment at least for a while.

2. Standardisation.

Not all the answers agreed that standardisation had taken place. The Yarn Mills in particular claimed that their product depended upon fashions and that standardisation was therefore impossible. The South Metropolitan Gas Co. have always made standard by-products and can only seek to maintain and improve their quality.

Among the firms who did claim to have standardised, various effects upon labour were experienced :—

(a) It was claimed that skill of a kind was still wanted. For instance the " other " Chocolate Factory pointed out that the demand for skill had not been eliminated, for " quality can still only be obtained by constant vigilance and care in grinding and dealing with raw materials." Messrs. Rowntree make the claim that standardisation has resulted in skilled employees devoting a much larger proportion of their time to the skilled portions of their job, and Messrs. Hazell, Watson and Viney also claim that skill and experience are still required for controlling and adjusting complicated machines. Messrs. Hans Renold have provided us with most important figures showing that they employ skilled men in the same proportion as before the war. We may quote part of their answer to our question in full :—

" The effect of standardisation and, more particularly, of sub-division of processes has shown itself mainly by a transfer of work from semi-skilled and unskilled men to women. The same number of fully skilled craftsmen are employed now as in 1913, and mainly on the same work, viz. : making tools and maintaining equipment. This class, moreover, bears the same proportion to the total personnel now as in 1913, though the output of the factory has increased 30 to 40 per cent. The facts are given below :—

	Men.					Women.
Year	Total	Fully Skilled Craftsmen	Semi-Skilled Machinists	Unskilled	Clerical	
1913...	1,000	250	350	300	100	310
1927...	680	250	185	85	160	680

Messrs. Renold are thus employing 50 more persons than in 1913, but the proportion of women to men has risen from 31 per cent. to 100 per cent. The male clerical staff has increased but the number of semi-skilled and unskilled men has fallen off considerably. The most interesting feature of all, however, is the stability in the numbers of the skilled craftsmen.

(b) Where skill is not required monotony is often avoided, we are told, by selecting those persons to do the unskilled or semi-skilled work who prefer repetitive work or to whom it is not distressing. The management at the " other " Chocolate Factory consider " that there is a very considerable number of men who do not wish to be engaged in an occupation that requires too great mental concentration. They are quite content to keep working on jobs which to some minds might appear to be monotonous." Messrs. Hans Renold claim that women show in general less objection than men to repetition work. This is important in view of Messrs. Renold's increased employment of women on unskilled jobs. Messrs. Rowntree are still more specific. " Monotony," they say, " is the result of the subjection of a highly organised mind to repeated operations of a simple nature. Suitable selection so that the intelligence level is equated with the type of process has in our experience considerably reduced complaints about monotony and uninteresting work."

(c) Where the danger of monotony is admitted, palliatives are often found by the transference of workers from job to job as at Messrs. Hans Renold, by encouraging singing as at the Shredded Wheat Company and Rowntree and Company (either at work or in the rest pause), or by introducing special bonus payments and by exhibiting statistical results so as to introduce economic or sporting interests. These policies will be further considered with answers to Questions 3 and 5.

Several firms, as Electric Control Limited, admit that the percentage of skill required is decreasing. But no firm admits that any complaints have been received about monotony. It is probable, however, that employees would hardly complain of any general condition of boredom, but would either take it as a matter of course or make their complaint specifically about some detail of the job. The fact of there being no complaints of monotony cannot be taken as conclusive.

3. The Use of Statistical Records.

All the firms replying to the questionnaire claim to have useful methods of recording the efficiency of labour and management, and the chief difference among them concerns the degree to which labour is allowed to see results and the class of record shown. At the Sweet Factory where each department is costed separately every three months, these costing records are not shown to employees. At other works, i.e., Hazell, Watson, and Viney, and Electric Control, Ltd., costs sheets are explained and exhibited to the overseers, managers, and heads of departments, etc., but not to the individual employees.

In several works, however, the exhibition of statistical records to the rank and file was found of great value. At J. Wedgwood and Sons, a quarterly report is drawn up by the Secretary of the company, passed by the directors, and presented to the Works Committee showing (a) the volume of orders and sales received and made and the trade prospects ; (b) the cost of manufacture and distribution per cent. of

sales for the quarter ; (c) any other points in the policy or fortunes of the firm likely to be of interest. At Hans Renold's and Rowntree's publicly displayed records of production or waste were found to encourage output, and at the Melingriffith Tin-Plate Works " records of output and waste have been put before our mill-men from time to time with a view to securing their appreciation of difficulties and consequent co-operation." At the Shredded Wheat Company the record sheets are used to compare month by month the cost in each department. " These may be seen at any time by employees, and in case of variation, either up or down, employees are consulted as to cause."

In fact, the effect upon labour of statistical records must depend entirely upon the degree to which labour interests itself in the making and exhibition of these records and appreciates their relevance. The matter must be further considered among the answers to question 9, the degree of democratisation.

4. Stabilisation.

There is a growing tendency in Great Britain to use statistical services for forecasting marketing conditions in the effort to reduce cyclical swings in business. A certain measure of support is given to the London-Cambridge Service and the Federation of British Industries endeavours to help its member firms. Any forecast, however, for a substantial period ahead must be made by the individual business. The employment of a person with the necessary economic training is still quite exceptional in British industry. Furthermore, not only are British public statistics very inadequate, but conditions since the war have been so abnormal as to make forecasting very difficult. While, therefore, in certain cases forecasting based on statistics has been of some effect in stabilising production and employment, this, no doubt, has been slight and quite exceptional. More has probably been achieved in the direction of internal planning with the aim of meeting a seasonal or intermittent demand by a more stabilised production. Obviously this presents much difficulty since some firms have very special markets or manufacture perishable goods ; others make only for orders, whilst others are subject to trade arrangements organised by the industry as a whole, and can make little individual efforts to regularise production. By reason of these difficulties, the stabilising of employment is not generally effective among British firms.

This general statement is borne out by the evidence of the replies to our questionnaire.

With a few exceptions a policy of stabilisation was not found to be practically effective among the individual firms that replied. Some of them like Electric Control Ltd., had very special markets, others like Hazell, Watson, and Viney made only for orders, others like the Melingriffith Tin-Plate Works were subject to trade arrangements organised by the industry as a whole and could make no individual effort to stabilise. Some attempts at stabilisation were reported, however, by Hans Renold, Rowntree, and the " other " Chocolate

Factory, and also by Electric Control Ltd., in so far as they could make for stock. The two chocolate works and Messrs. Pascall were handicapped by the perishability of their products. This handicap applied also to the Shredded Wheat Company who stabilised only in their purchasing department. In certain cases like Hans Renold and Rowntree outside statistical services, like the London and Cambridge Economic Service, were used, but this was generally supplemented by more detailed statistics of their own particular trade.

On the whole, we may conclude that little has been done, though a beginning has been made, in regularising employment by stabilisation policies on the part of individual firms.

5. Introduction of Payment by Result.

Payment by result appears to be the rule in most of the firms replying, with the exception of Messrs. Hans Renold, who stated that since the war, their tendency has been to abandon payment by result in most cases, except for engineering craftsmen on ordinary engineering machine shop work. Taken in conjunction with Mr. Henry Ford's policy of time wages, this reaction from payment by result is very significant.

Where payment by result is the rule, various forms of such payment were found :—

1. Where straight piece-rates are paid it is always claimed that wages are higher than they would be on time rates and that there is no objection from the workers though, when the system was first introduced, there may have been mistrust. The direct labour costs per job are reduced, though this may be partly offset by the expenses of the additional inspection required to ensure good quality of work and to avoid seamping. At Messrs. Arthur H. Lee and Sons a definite rate for quality is paid as well as a piece-rate. This quality rate is " assessed when the work is inspected and classed, and amounts to about 25 per cent. of the production rate for first-class work being graded down according to quality of work. This quality rate forms an effective safeguard against bad work." It is clear that without additional inspection or such payment by quality, straight piece-rates would affect the standard of work turned out, and that the cost of these measures must be set against the lower direct labour costs of production.

2. Another form of piece wage was that of the premium bonus as typified by the system at Electric Control Ltd. Here, the employee is paid time wages for the time taken plus 50 per cent. of the time saved. The Electric Control Ltd. report as a result that " our output has increased 30 per cent., wages 15 per cent., and labour costs have fallen." They report their workers to be in favour of the scheme but that quality must be kept up by inspection. The same sort of result from a premium bonus system is found at Mander Brothers and the Shredded Wheat Company, though in both these cases there were difficulties and suspicion when the system was first introduced.

3. The United Dairies Limited have a plan of payment by sales. " Each man's sales are recorded weekly on blackboards in mess-rooms for all to see. Challenge Cups are given to the best salesmen." This combination of piece-rates and exhibition of statistical results is said to have developed a sporting spirit and keen competition between men in the same depots. Wages have increased, costs slightly reduced, workers are believed to be contented.

The effect upon labour of payment by results appears to us to depend very largely upon the method of introducing and administering any new system, in particular the degree to which labour is consulted before changes are made. The matter will be taken up further, therefore, under the question of democratisation.

6. The Introduction of Time Study.

Time study was undertaken by only a limited number of the firms replying to the questionnaire. Electric Control Ltd. do not use a stop-watch except when a worker challenges a time as being too short. Times are estimated by splitting the job into elemental operations, and where machine work is involved the machine's speeds are taken into account, otherwise the operations are judged on the experience of similar work. Time studies proper are reported only from Lee and Sons, Renold, Rowntree, and the " other " Chocolate Factory. Details of time-study methods adopted in the two latter firms appear on pp. 16-18 in our review of **Working Conditions other than Hours and Wages.** Suspicion at the outset was reported from Rowntree's, but all report subsequent confidence so long as the piece-rates based on the time study are not cut.

7. Various Measures Associated with Industrial Psychology.

Great strides have been made in England in the application of psychology to factory problems. This development, which in its scientific thoroughness is perhaps peculiar to this country, is largely the work of the Industrial Fatigue Research Board and the National Institute of Industrial Psychology. Many of the methods introduced by the National Institute were said to be in operation at some of the factories sending us replies.

Messrs. Rowntree report that " before the introduction of vocational tests our methods of selection compelled secondary and later transfers in 20 per cent. of instances. Our use of vocational testing and training has reduced this figure to 10 per cent. in the case of factory boys, 5 per cent. in the case of factory girls, and to an almost negligible figure in the case of women clerks.

" Selection has reduced labour turnover in crucial instances where without a psychological test an individual would have been dismissed. Often careful testing of workers of some years of service has enabled us to find work on which such an employee may make good.

"Selection and training by shortening the time necessary to reach an output standard to that extent have increased the quantity of output, and selection, training, and motion-study applied conjointly to juvenile labour have had quite significant results in increased output and increased earnings."

In selecting their workers many of the firms replying to our questions seem to content themselves with the observation of junior employees and their promotion if found satisfactory. Messrs. Hans Renold are frank about it. "We want as employees people who are adaptable and will develop rather than prestidigitators for particular jobs. Correct initial placing under this policy is not our main consideration and actual experience with new workers soon enables us to place them in the line of work for which they are most suitable." The South Metropolitan Gas Company observes the progress of juniors; new applicants are interviewed by the Employment Manager and if found satisfactory given a physical examination. Howard and Sons deliberately changed round the jobs of their juniors to try out what they are most suited for and take on all new comers on trial for a probationary period so that there is ample opportunity for the elimination of unsuitable workers. As careful selection is made in the first place such eliminations, it is claimed, are seldom necessary.

Motion study, rest pauses and appliances to ease the strain of work were found in one form or other at most of the firms replying. Messrs. Lee and Sons report the reorganisation of one hand-work job as a result of study by Gilbreth's Chronocyclegraph that obtained an increase of about 52 per cent. in production and 40 per cent. increase in wages. And rest pauses of about a quarter of an hour every morning are mentioned by Messrs. Pascall's, the Shredded Wheat Company, Howard and Sons, Rowntree's and Hans Renold. At Messrs. Lee and Sons they were introduced in four departments.

The calculation of the effect of these measures on labour turnover was found rather difficult, but all who had sufficient experience agreed that the measures had increased confidence among the working force, had reduced fatigue and added to the worker's comfort.

8. Functionalisation.

To avoid undue prolixity we must confine our attention to those aspects of functionalisation that affect labour and may concentrate on the question how far special departments have been formed in each firm to centralise responsibility for some or all aspects of labour.

Wherever central departments have been formed, e.g., at the South Metropolitan Gas Works, Messrs. Pascall, Messrs. Renold, one of these is usually a department dealing with specific labour problems. It is fairly common to find an Employment Department entrusted with the responsibility for the hiring of labour, as at the South Metropolitan Gas Company. At Electric Control Limited, there is also a special rate-fixing department. In no case does there seem to be

a complete system of functional foremen such as has been advocated in America, and so far as we can find from the replies only one firm, Rowntree's, has a central department of personnel management dealing with all labour problems. Here the Labour Manager reports direct to the Labour Director on the Board and organises the work carried on in connection with all matters of wages ; employment, including medical, dental and optical care ; welfare, including schools, games, camps and recreation ; education, psychology and time office records. All aspects of labour relations throughout the factory with the exception of the clerical staff, come under his control. He negotiates with Trade Unions on all matters, and is the administrative officer, who would report proposals of the firm to the Works Council and put into effect any decision of the Works Council on any matter within its compass.

It is noticeable that some firms like " the other " Chocolate Factory and Hazell, Watson and Viney have not developed functionalisation, while others like Hans Renold exhibit a distinct reaction from that policy which, they claim, did not have the approval of their men. In this matter someting depends upon the size of the establishment since a small firm does not require a devolution of specific duties, and even in larger concerns personality may count more than system. By reason of the newness of this development it is impossible to generalise on its effects, though it has undoubtedly made for more appropriate treatment of labour matters.

9. Democratisation.

Answers to this question are discussed under effects upon labour of working conditions other than Hours and Wages, Section IV D below. The close connection of democratisation with such industrial developments as time study, payment by result, functionalisation and the use of statistical records is, like industrial psychology, a peculiarly British feature.

IV.—CONCLUSIONS AS TO THE EFFECTS UPON LABOUR.

M. Devinat in the questionnaire submitted to all national sections on " The Social Aspects of Rationalisation " groups his questions under six headings :—

1. Unemployment.
2. Hours of Labour.
3. Wages.
4. Overwork.
5. Monotony.
6. Qualifications required of the worker.

These headings may be adopted for the sake of international uniformity, the last three being included, however, under the general title of working conditions other than hours and wages.

A.—UNEMPLOYMENT.

The evidence of the employers that have sent replies is to the effect that the number of their employees has not decreased. The very complete statistics of unemployment that are officially obtained in England under the Unemployment Insurance scheme do not lend any colour to the suggestion that rationalisation has caused unemployment. The highest percentage of Unemployment to-day (Labour Gazette, May, 1927), is rather in those industries like coal-mining (17.8 per cent.) and shipbuilding (25.9 per cent.) where rationalisation is conspicuous by its absence. The high and unprecedented level of unemployment experienced in England since 1921 is in the opinion of most Economists due to the Governmental Policy of monetary deflation, to tariffs and barriers, to trade abroad, and to the immobility of labour in the industries like Iron and Steel, Engineering, Shipbuilding and Coal that catered for the war, rather than to any measures of industrial reorganisation.

The substitution of machines for men (Question I) and agreements to limit production (Question 10) are the measures most likely to cause unemployment. If care is taken to adopt these measures gradually, labour can probably be immediately re-absorbed directly or indirectly at each stage, as several employers report they have done. But should these measures be introduced suddenly on a large scale unemployment would have to be met by palliatives. Most of those unemployed would eventually, owing to the increased efficiency of the industry, find employment again, and meanwhile destitution should be avoided by the standard or covenanted benefits of the State Unemployment Insurance scheme which was originally planned precisely to meet temporary unemployment and not the long-drawn-out " disemployment " existing to-day.

B.—HOURS OF LABOUR.

There is no evidence that the modern developments in any of the firms sending replies have led to increased hours of work. In England hours of work are strictly circumscribed by collective agreement with Trade Unions (though not as yet by international convention) and a great weakening of the power of Trade Unions or a long struggle like the Coal Strike of 1926 would have to occur before an increase in hours need be feared. Whether such an increase in hours would be effective in obtaining any " rational " object such as increased output is dealt with in detail in our separate report on Hours of Work, prepared by Dr. Vernon.

C.—WAGES.

On the whole, the evidence submitted by employers is that such measures as the increased use of mechanical devices, the use of statistics, payment by result, and time and motion study, tend to increase the earnings of those employed. These measures certainly increase the product per man and some of the additional productivity accrues to

labour. This outcome is not, however, the automatic and infallible consequence of economic laws, but depends largely on the employers' sense of fair play and the strength of the organisation of workers for collective bargaining in Trades Unions and Works Councils.

Among the English employers replying there seems to be no trace of that form of the high wage economy theory expounded by Mr. Henry Ford, among others, to the effect that high wages pay regardless of any increase in working capacity and willingness, merely by putting more money in workers' pockets and making them a better business market.

D.—WORKING CONDITIONS OTHER THAN HOURS AND WAGES.

Though hours are not increased and wages do not fall there is still the possibility that labour may suffer by overwork, fatigue due to increased intensity of labour, and by monotony and lack of interest in work. These possible effects of rationalisation are very real and amount to probabilities unless workers are given some share in determining the measures and processes of rationalisation. Hence the importance of democratic control raised by question 9 of our questionnaire. At least half the firms sending replies reported the existence of joint works councils or committees "for facilitating discussion between managers and workers." Most meetings of these councils or committees were held during working hours on company time, and in some cases, as at Mander Bros., the workers' side "is based on Trade Union organisation to which the firm give every recognition and encouragement."

Other firms, however, reported discussion with the foremen and staff only, while others (particularly smaller works) considered that sufficient touch was maintained ("anyone could see the directors") without special organisation, and few of the actual works councils reported to exist could be said to give the workers any share in the functions of management, e.g., in the **general** administration of **necessary** industrial activities such as the fixing of wages and hours of work. This limitation is frankly admitted by Messrs. Pascall's, Hazell, Watson, and Viney, the Yarn Mills, the Sweet Factory, and other firms. Democratisation is in those firms confined to welfare work, social activities, and benevolent funds, to individual grievances and disciplinary action.

Works Councils that can truthfully be said to participate in general policies of industrial management have at least two points of contact with the new industrial developments : (1) in time study as a basis for payment by results ; (2) in the development, explanation, and exhibition of statistical records of labour and management efficiency.

1. In view of the defective methods of time study often advocated as part of so-called scientific management* the participation of labour in the setting of piece rates is particularly important.

* For details see Florence "Economics of Fatigue and Unrest." Chapter III.

Attention should be drawn to Messrs. Rowntree's procedure: "Time study was adopted in 1923 in order to increase the general efficiency of the establishment, and to make for sounder piece-rate arrangements. Our method is to have in each section of the works a Standing Committee, comprising the Manager and the overlooker in charge of the process involved, and two representatives of the workers, one of these being the Shop Steward. This committee selects the workers to be time-studied, who must be workers of average ability, reasonably experienced and likely to work conscientiously under test. The committee is responsible for seeing that the conditions under which the tests are made are such as would normally be practicable. The Time Study Investigator takes a sufficient number of observations with a stop-watch on each element of the operation, making full allowance for unproductive time. He then calculates an output standard, adding to his written statement a definite description of the conditions of work under which this output standard will be expected. The standard is then submitted to the workers' representatives, and must be agreed to by them before piece-rates are set.

"The adoption of Time Study followed upon a long negotiation with our workers, in which its rationale and its methods were explained and discussed. Safeguards of the workers' interests were introduced; some of these have just been mentioned in connection with the description of the method. In addition, the firm undertakes to compensate the workers for any departure from standard conditions which is due to the default of the management, and no alteration in standard output is made unless it is agreed with the workers' representatives that a change has taken place in organisation, machines, material, form of the process or other conditions which may affect the rate of output attainable for the same effort."

The "other" Chocolate Factory also arranges for representatives of labour to participate: "Time studies are an accepted method of arriving at some of the data necessary for the fixation of proper rates. The Secretary of the Shop Committee concerned is notified by the Piece-Rates Department of the intention to time-study a particular operation, and the workers may, if they wish, appoint one of their number to be present whilst the time-study is being made. In practice, however, we find the right is not exercised, as all the data on which the rate is fixed is available, not only to the workers' representatives on the Piece-Rates Committee, but also to any of the workers themselves for examination if they so wish. There is always plenty of opportunity for the data on which the rate is based to be questioned before the rate goes into operation. This does not mean, of course, that the workers always willingly accept the basis. They may, and do, occasionally think that the expected output is too high, but the Piece-Rates Committee deal with each case on its merits."

2. The democratic review of the efficiency of management is an important factor making for confidence in any system of profit-sharing. A personnel, conscious of strenuous efforts throughout the past financial year, that is met by a statement of no profits, will naturally want to

know the reason why. The Profit-Sharing Committee at Hans Renold's is made up of delegates from the Shop Committee based on Trade Union membership, the Foremen's Committee, and the Staff Committee, and receives every four weeks full financial information of the position, progress and problems of the business. "The benefit of this policy of publicity in promoting co-operation" has, we are told, been very great indeed. At the South Metropolitan Gas Co., the participation of employees in running the profit-sharing scheme is secured by the election of representatives to the Co-partnership Committee. The general interests of employees are also assured by the election of three of their number to seats on the Board of Directors.

Apart from profit-sharing and sharing in all the gains added by rationalisation generally, labour may regard participation in the development and explanation of statistics of efficiency as a very necessary basis for all intelligent co-operation and a method of safeguarding their interests as against pseudo-scientific contentions.

A scientifically informed control that is exercised jointly by employers and employed may indeed avoid or mitigate many of the dangers to labour threatened by modern developments. The possibility of over-fatigue by speeding up is met by workers' participation in time studies conducted by experts ; and the need for discharging skilled men and for lowering industrial qualifications to a level of monotony would first have to be proved by reference to comparative statistics of labour and machine efficiency and costs. In short, to control working conditions that are not, like maximum hours and minimum wages, determinable by collective agreements, works councils and employee representation generally seem a necessary complement to all schemes of individual firms for developing their methods of operation and management along enlightened, scientific, and truly "rational" lines.

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REPORT

ON

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This report was prepared by a Sub-Committee of the British Section of the International Association for Social Progress for the Annual Congress held in Vienna, 1927.

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The Experience of Great Britain on Output in Relation to Hours of Work

INTRODUCTION.

The experience of Great Britain on the question of output in relation to hours of work may be said to have begun over a century ago, when Robert Owen reduced the working hours of his cotton operatives from the usual 14 a day down to 12½, then to 11½, and finally (in the year, 1816) to 10½ a day. He found that the output did not fall sensibly below its previous amount, whilst the cheerfulness and alacrity of the workers greatly improved. From 1802 onwards, legislation had been gradually introduced in order to limit the hours of work of children and young persons, and in 1847 a Ten Hours Bill was passed which restricted the hours of women and young persons in cotton mills to 60 per week; but no exact information is available as to the effect of the reduction of hours on output. Previous to the great war, the hours worked in most trades were usually from 53 to 55 per week, in spite of the evidence obtained in several instances which showed that a reduction to 48 hours per week did not adversely affect output. The best of this evidence was obtained by Messrs. Mather and Platt in 1893, when they reduced the hours at their engineering works from 53 to 48 a week. As a result of an accurate comparison of output in the year before and the year after the change, they found that the total output from the works was slightly increased. During the first four months after the change of hours the output of the piece-rate workers fell 0.9 per cent.; in the next four months it fell 0.7 per cent., but during the last four months it rose 0.1 per cent. The output of the time workers was affected rather more favourably than that of the piece-workers, and hence the rise in the total output of the workers. At another engineering works (The Scotia Works, Sunderland), it was found that a change from a ten-hour day to a nine-hour day (i.e., a 54-hour week) caused no fall of output, whilst a subsequent change to a 48-hour week caused a slight improvement of output. In the light of these experiences, the hours of work of 43,000 workers in Government factories and workshops were, in 1894, reduced to 48 per week, and it is stated that output was not diminished in consequence, though it does not appear that a very exact comparison was made.

It should be realised that the output observations referred to relate to the entire production of factories where, during the comparison periods, there were bound to be some changes in the character of the articles produced, the personnel, and other conditions, besides the reduction of hours. Hence the results are not absolutely convincing, and they certainly did not induce the great majority of the employers in this country to adopt a 48-hour working week.

THE WAR EXPERIENCE.

So little had the beneficial effects of reduced hours been generally appreciated that when, on the advent of the great war, the maximum production of munitions became a matter of supreme importance, it was customary for employers to extend the working hours to 65, 75, and exceptionally, to from 80 to 100 hours per week. In consequence, the health of many of the workers was gravely affected, and production tended to fall off. In order to rectify this partial breakdown, the Ministry of Munitions appointed a "Health of Munition Workers' Committee," the purpose of which was :—

> "To consider and advise on questions of industrial fatigue, hours of labour, and other matters affecting the physical health and physical efficiency of workers in munition factories and workshops."

This Committee was appointed in the Autumn of 1915, and during the next two and a-half years it issued 20 memoranda and two reports, dealing with various questions falling within its terms of reference. Information was collected for the Committee by several investigators at a number of munition factories, where they had unrivalled opportunities of ascertaining the influence of changes in the hours of work on output, lost time, sickness, and accident frequency. To quote a concrete instance*, at a factory of nearly 10,000 workers, the majority of whom were making time fuses, it was possible to obtain the output data, over a period of two years, of large groups of men and women engaged upon various standard mechanical operations. The conditions under which the articles were produced were exactly the same throughout with one exception, namely, the hours of work. At first, the operatives were on a twelve-hour day, with somewhat shorter hours on Saturday and Sunday, so they were usually called upon to put in 77¼ hours of work a week. As there was a free Sunday once a month, the hours averaged 74½ a week. After a time, a ten-hour day was adopted, though still with Sunday labour, and the hours averaged 63½ a week. Still later, Sunday work was abolished and the hours fell to 55½ a week. Hence there were three clear cut systems of hours in which to ascertain the speed of production. After each shortening of hours the speed of the workers increased, but it rose at a slow rate, and took two to four months in order to reach a steady level. The gradual speeding-up was adopted unconsciously by the workers, and was presumably due to the increase of vigour and health induced by the reduction.

In the operation of turning aluminium fuse bodies (on capstan lathes), the output of a group of about 100 women was studied. Only experienced operatives were included, and it was found that in the 74½-hour period their relative rate of production corresponded to a figure of 108 per hour. The time keeping of the women was very bad, and they put in only 66.0 hours of actual work per week, so their total rate of production is expressed by the figure 7,128 (i.e., 108 x 66).

* cf. Memos. Nos. 12 and 18, 1916 and 1917, also Report No. 6, I.F.R.B., 1920.

During the $63\frac{1}{2}$-hour week period their hourly rate of production increased from 108 to 131, or in similar proportion to the reduction in working hours, so their total weekly output remained unchanged. During the $55\frac{1}{2}$-hour period, however, they quickened in greater proportion than corresponded to the reduction of working hours, and we see from the data adduced that their weekly output was now 13 per cent. greater than at first, in spite of the fact that their actual hours of work per week were $18\frac{1}{2}$ less.

In tho 74.5 hour week, total output was	66.0	x	108	=	7128	(=100)
,, 63.5 ,, ,, ,,	54.4	x	131	=	7126	(=100)
,, 55.3 ,, ,, ,,	47.5	x	169	=	8028	(=113)

In the operation of "sizing fuse bodies," the output of 27 to 90 men was studied. The men fastened each fuse body to a handle, and screwed it round rapidly by hand into a steel tap. The operation is rather a heavy one, and the men perspired freely, so at first they worked for ten hours on some days and twelve hours on others. There was some Sunday labour, and the nominal hours of work averaged 66.7 per week, but owing to bad time-keeping the actual hours were 58.2 a week. Subsequently, the men went on to a regular ten-hour day, with intermittent Sunday labour, and their rate of production increased in greater proportion than corresponded with the reduction of working hours, so that their total weekly output was somewhat increased. A still better result was obtained later on when Sunday labour was completely abolished, and the men knew that they would get a regular week-end rest. They improved in time-keeping so much that they put in nearly as many hours of actual work as before, and their rate of production was 37 per cent. greater, so their total weekly output was 19 per cent. more than it had been originally.

In tho 66.7 hour week, total output was	58.2	x	100	=	5820	(=100)
,, 60.2 ,, ,, ,,	51.0	x	120	=	6120	(=105)
,, 55.5 ,, ,, ,,	50.4	x	137	=	6905	(=119)

The more favourable response of these men to reduced hours of work than that of the fuse-turning women was probably due to the fact that their speed of production was in no way limited by machinery, and they could quicken up as much as they pleased.

In a third operation studied, known as "boring top caps," the youths employed were absolutely limited by the machine. About four times a minute they unclamped one top cap from a semi-automatic machine and clamped in another, these two clampings together occupying less than two seconds. For the remainder of the time they stood at their machines doing nothing. Output data collected under two systems of working hours gave the following result:—

In tho 76.8 hour week, total output was	70.6	x	105	=	7413	(=100)
,, 60.1 ,, ,, ,,	54.5	x	127	=	6922	(=93)

It will be seen that when the actual hours of work were reduced from $70\frac{1}{2}$ to $54\frac{1}{2}$ a week, the speed of production increased from 105 to 127; but this improvement was insufficient to compensate for the shorter working period, and the total production showed a fall of

7 per cent. It may be wondered how it was that the youths were able to quicken up at all when put on to a shorter working week. It was due almost entirely to their sticking better to their job, and wasting less time in starting up at the beginning of the work spells, and in shutting down towards the end of them. It is true that both in this and in the other operations studied, a small fraction of the improved output may have been due to the increasing manual skill of the operatives, but the steadiness of the output over periods of several months, once equilibrium with the reduced hours of work had been attained, showed that this factor was of very slight importance.

Arguing from the evidence quoted, and from other information, it was concluded that if a maximum production was required during war time, it would have been best to put the women fuse-turners and the men sizers on to a 50-hour week, and the top-cap youths on to a 70-hour week. Women engaged on semi-automatic machines would probably do best on a 60-hour week. It should be realised, however, that hours of work suitable for war time, when every patriotic worker would be exerting his maximum effort, do not by any means hold for peace time. Then the worker expects to have a surplus of energy and time left after his day's work is over, which he can devote to amusements, and hobbies such as gardening, and to household duties. So it is suggested that a 48-hour week is all that could be reasonably expected of men and women engaged in occupations requiring a similar expenditure of energy to the sizing and fuse-turning operations described. Youths engaged on light machine operations similar to the boring of top caps might, from the point of view of production, be expected to work a longer week, but there are considerable objections to keeping some employés at a factory permanently on longer hours than the rest, unless they constitute the majority of the workers. Again, any considerable excess of hours above the familiar 48 per week would encroach too much upon the leisure to which every man is entitled, so a 48-hour week appears to be a reasonable one, both in its physical and its psychological aspects.

POST-WAR EXPERIENCE.

The value of the investigations of the Health of Munition Workers' Committee to industry was considered sufficient to warrant their continuation and extension to post-war conditions, and in the Autumn of 1918 the "Industrial Fatigue Research Board" was appointed, under the joint control of the Medical Research Committee and the Department of Scientific and Industrial Research. The terms of reference of this Board were :—

> "To consider and investigate the relations of the hours of labour and other conditions of employment, including methods of work, to the production of fatigue, having regard both to industrial efficiency and to the preservation of health among the workers."

In 1921, the Board was reconstituted, and came more directly under the control of the Medical Research Council (as it had now become). Its terms of reference were somewhat widened, and took the following form :—

> "To suggest problems for investigation, and to advise upon or carry out schemes of research referred to them from time to time by the Medical Research Council, undertaken to promote better knowledge of the relations of hours of labour and of other conditions of employment, including methods of work, having regard both to the preservation of health among the workers and to industrial efficiency; and to take steps to secure the co-operation of industries in the fullest practical application of the results of this research work to the needs of industry."

The Board is directed by a committee of 12 members, and it has about 15 whole-time investigators under its charge. These investigators have made various detailed inquiries into subjects of interest to industries in general, such as the causation of accidents, the effect of introducing rest pauses, vocational guidance and selection, ventilation and heating, motion study, etc., and specific inquiries in individual industries such as those of iron, steel and tinplate production; coal mining; cotton linen and silk weaving; pottery; glass manufacture; boot and shoe manufacture; and laundry work. Forty-three special reports have been published by the Board, together with six annual reports, whilst many other papers have been published by the investigators in various scientific periodicals.

The Board works in co-operation with various Government Departments such as the Home Office, the Post Office, and the Mines Department, and also with the "National Institute of Industrial Psychology." This latter organisation was founded in 1921 on an entirely voluntary basis, and its principal objects are to carry out investigations (for which payment is made) at the request of individual firms, and to train investigators in industrial psychology. It has received several large grants in aid from the trustees of the Carnegie United Kingdom Trust, one of them being earmarked for a comprehensive investigation on vocational guidance. It publishes short reports on many of its investigations in the Quarterly Journal of the Institute, along with reviews of recent literature.

After the war there was a change to a working week of 47 or 48 hours, and sometimes to one of 44 hours, in almost every industry. The alteration of hours was usually accompanied by other changes in the conditions of production due to the passing of the war period, so investigators did not, as a rule, have much chance of getting accurate information about the effect, on output, of changes exclusively in working hours. However, the investigators of the Industrial Fatigue Research Board obtained a good deal of information about various continuous processes in the iron and steel trade*. In these processes it was frequently the custom to work two twelve-hour shifts, but now

* cf. Reports Nos. 1, 5, and 24, 1919, 1920, and 1924.

three eight-hour shifts have been almost universally adopted. This substantial reduction of working hours caused very little increase in the rate of production of the rolling mills and of the blast furnaces, but in some cases it was possible to reduce the number of men required in each shift at the blast furnaces, though the total number employed was greater than before. At one works the weekly output of the open hearth steel furnaces showed an 18 per cent. improvement after the change of hours, but at another works the improvement was only 2 per cent. Again, the weekly output of the puddlers of wrought iron increased 15 per cent. when they went on to the three-shift system. In the tinplate industry, the millmen sometimes worked eight-hour shifts and sometimes six-hour shifts, their hourly rate of production in the latter case being 10 per cent. greater. Again, in glass bottle manufacture the hourly rate of production was found to improve 10 per cent. when the men changed from ten-hour shifts to eight-hour shifts. It will be seen, therefore, that in all of these heavy industries it was not possible for the men, by working more strenuously, to compensate for more than a fraction of the reduction in the hours of work.

In the coal mining industry it was customary to work a so-called eight-hour day before 1919, though this meant that the miners were underground about eight and a-half hours on an average. In 1919 the seven-hour day was introduced, corresponding to seven and a-half hours underground, and this reduction of hours was found to cause a distinctly smaller reduction of output than is proportional to the change of hours. In determining this proportion, it must be remembered that the coal hewer spends so much time in getting to and from his working place, and in taking time off for a meal, that he is able to work only six and three-quarter hours at the coal face out of his eight and a-half hours underground: or correspondingly, for five and three-quarter hours out of his seven and a-half hours underground. In the autumn of 1926, after a dispute lasting seven months, the seven-hour day was changed back to an eight-hour day in some districts, and to a seven and a-half hour day in others, in order to improve output.

The effects of a moderate reduction of hours in the boot and shoe trade appeared to correspond with those observed in munition workers. Thus it was found* that when the hours of work were reduced from $52\frac{1}{2}$ to 48 per week, the weekly production of a group of 20 male "clickers" increased 5 per cent., whilst that of a group of women engaged in "closing" improved still more.

The effect of a reduction of hours below 48 per week was studied in several industries, with unexpected results.† Groups of male and female operatives engaged in heel building, labelling and box making, were put on to various degrees of short time, and were allowed to

* cf. International Labour Review, p.729, 1924.

† cf. Journ. Nat. Inst. Indust. Psych. II., pp.155 and 300, 1924; also Report No. 23 of Ind. Fat. Res. Bd. 1924.

work only three to five days a week. In fact, their hours of work varied between the extremes of 24 and 48 a week, and it was found that though, on reduction of hours from 48 to 40 per week, their hourly rate of production increased from two to ten per cent. : yet on further reduction of hours it fell steadily, and when a three or three and a-half-day week was worked it was 9 per cent. less than when a five day week was worked. Again, when a group of cotton weavers were changed from a six day working week to a four day week, their rate of production fell off 6 per cent. The loss of speed in these occupations appeared to be due partly to the loss of manual skill entailed by the long week-end rest, and partly to psychological influences, such as the discontent of the workers induced by the short time.

THE LENGTH OF WORK SPELLS.

Output is dependent, not only on the total number of hours worked per week, but on the manner in which these hours are distributed over the day. In Great Britain it is the universal custom to take a holiday on Saturday afternoon, so a 47 or 48-hour week means an eight and three-quarter-hour day. Before the war it was usual, in most industries which adopted a 53 to 55-hour week (i.e., a nine and a-half-hour day), to proceed on the two-break system, according to which work started at 6 a.m. or 6.30 a.m., and continued for two hours. Then after half-an-hour's interval for breakfast, a spell of four hours' duration was worked, and after the dinner-hour there was another spell of three and a-half hours. With the advent of the 48-hour week the two-break system was dropped, and the daily round did not start till 7 a.m., 7.30 a.m. or 8 a.m. The eight and three-quarter hours of work required were divided by the dinner hour into two fractions, of which the morning spell was usually somewhat the longer, and in many instances amounted to five hours. Again, a certain number of employers have adopted a five-day working week, with a complete holiday on Saturday. This means that nine and a-half hours must be worked each day, these hours being usually split up into spells of five and four and a-half hours' duration.

THE INTRODUCTION OF REST PAUSES.

When a five-hour spell is imposed without any sort of break, it means that an interval of nearly six hours elapses between the meal times of the operatives. Conditions vary greatly in different industrial centres, but at three large factories where statistical observations were made, it was found that on an average from 35 to 50 minutes were required by individual workers to get from their homes to the factory, though it is true that at a fourth factory which was in close proximity to the homes, they took only nine minutes. If the workers come by train, tram or bus, they have to allow a few extra minutes for traffic delays, and again, they usually have to wait a few minutes before getting served with their dinner at the works' canteen. So greatly do many workers feel the lengthy abstinence from food, that they nibble food surreptitiously at odd times during the long work spell, unless strictly forbidden to do so by the management.

When five-hour spells are worked, therefore, it is the best plan to divide them into fractions by introducing a brief break of about ten minutes' duration, during which tea and a little food can be partaken of. Some employers grumble at the loss of time thereby entailed, as they find that a nominal ten minutes may mean 15 or 20 minutes' delay in actual practice. However, this is a matter of discipline, and at some factories the nominal rest period is maintained without difficulty. The effect of the rest on output is usually favourable, for observations* made on nine groups of women engaged on various kinds of light repetition work showed that only in one instance was there any reduction of total output, in spite of the loss of working time involved. On an average the output improved 6 per cent. provided that the comparison was made, not immediately after the rest pause was introduced, but several months later on. Five other groups of women who were tested immediately after the introduction of the rest showed an average improvement of 2.8 per cent., and it was evident that the improvement was produced unconsciously. As the result of the rest the workers felt more energetic, and in consequence they gradually got into the habit of working at a slightly higher speed. The rests are warmly welcomed by the workers themselves, as they afford a pleasant relief, not only from the physical fatigue of their labour, but still more from the psychological effects of monotony.

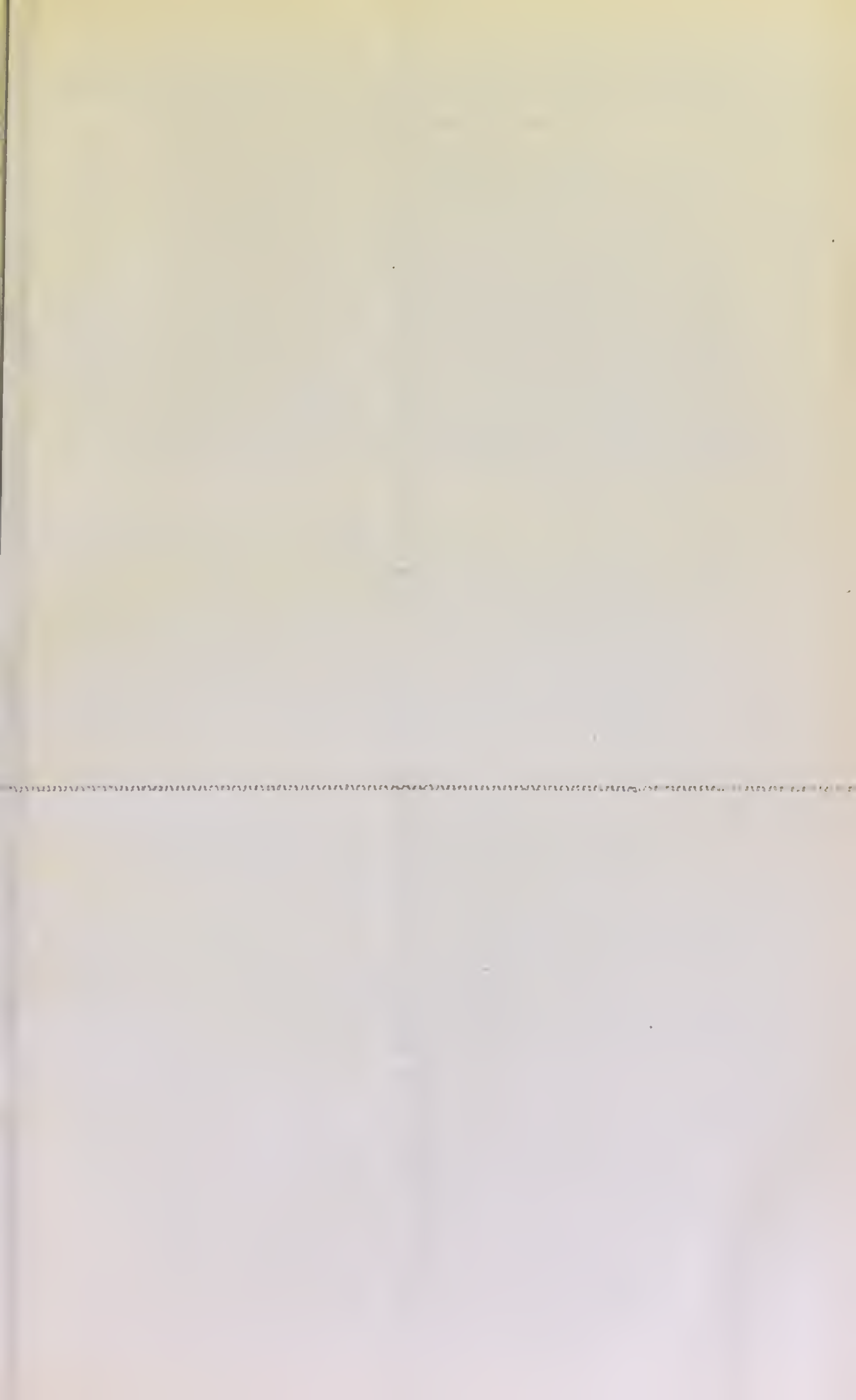
It must be admitted that the favourable effect of rest pauses does not apply to all occupations. It is best shown by workers employed on hand work, and the more their work is dependent on the machine the less can they compensate, by increased speed of production, for the loss of working time entailed by the rest. In cotton spinning, for instance, a loss of ten minutes' time would mean a nearly proportional loss of productivity, though in weaving, which depends so much more on the human element, it would not.

CONCLUSION.

It is evident that there has been a general tendency to a reduction of working hours in industry, and it may be doubted whether stability has yet been reached. In support of a shorter working day it must be admitted that industrial work, as it becomes more mechanical and more standardised, tends to become more monotonous. On the other hand, the standard of comfort aimed at by the community, with its increasing demands on production, is continually rising.

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* cf. Reports No. 25 and 32 of the Ind. Fat. Res. Board, 1924 and 1925 ; also Journ. Nat. Inst. Indust. Psychol. I., p.89, 1922.



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The object of the Association is to promote International Social Progress. It seeks to do so by the following methods :—

(1) Scientific research upon special subjects calling for attention.

(2) The preparation of public opinion in favour of social reform.

(3) Propaganda for the ratification and application of the Conventions of the International Labour Conference and—more generally—for the improvement of the conditions of labour.

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The Heart Problem of the Worker

by

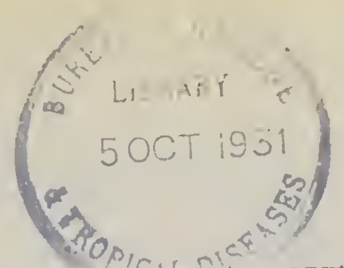
Carey P. McCord, M. D.

of

The Industrial Health Conservancy Laboratories,
Cincinnati, Ohio

Read at the 41st Annual Meeting of the Association of Life Insurance Medical Directors of America, October 23-24, 1930

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THE HEART PROBLEM OF THE WORKER

By Carey P. McCord, M. D.
of
The Industrial Health Conservancy Laboratories, Cincinnati, Ohio.

The Heart Council of Cincinnati, under the leadership of its President, who is also your President, during the past two years has conducted clinical investigations as to cardiac conditions in various types of employment. Up to the present time three series of 1,000 each have been completed. The first of these was limited to male office workers (1) ; the second to male factory machine and hand tool operators (2) ; the third to male negro factory workers engaged in physical operations somewhat more arduous than the white factory workers (3). Statistical compilations are available only on the first two groups. To this lot of 2,000 carefully examined white males have been added 165 examinations of train dispatchers, made during the same period and by essentially the same personnel (4). We thus have for consideration the findings from one group of male workers in physical operations, with a minimum of mental stress and strain; a second group of essentially sedentary workers without physical loads, but with a larger, but not remarkable, mental stress and strain; and a third and smaller group of sedentary workers without physical work activities, but characterized by a degree of continuous mental stress and strain probably not exceeded by any extensive group of workers in this country. Before entering upon a presentation of the noteworthy differences in findings, it is necessary to provide some additional general information as to the nature and scope of the examinations.

GENERAL PRINCIPLES AND METHODS GOVERNING EXAMINATIONS.

A frequent unfavorable criticism of the reports on the physical status of large numbers of persons is based on the fact that numerous physicians participated in the examinations, and thus, necessarily, introduce inescapable variables in technique and interpretation. To the recent admirable compilation by Sydenstricker and Britten (5), data was contributed to the basis materials analyzed by approximately 9,000 practicing physicians. In order to overcome this somewhat nullifying process, in our series, all save one block of 100 cardio-vascular examinations (Roentgen examinations excepted) have been made by one physician under highly standardized procedures. All examinees were obtained on a volunteer basis from the specified industrial classifications, after careful efforts to acquaint the prospective examinee of lack of bearing of the findings on employment, publicity, insurance, or insistence on relief measures. A greater freedom of mind was sought than that commonly obtaining in army, employment, or insurance examinations. Persons under medical care were rejected. An extensive social, work and medical history was obtained and recorded. In one series, these preliminary steps included mental testing, an inventory of the psychologic state, word association tests, etc. This phase of the inquiry was followed by items such as weight, height, vision, dentition, orthopedic conditions, skin, etc. Lastly, examinations embraced the viscera of the chest and abdomen. No undue emphasis was placed on the cardio-vascular testings, although such were far more thorough than carried out on such organs as the prostate. Special examinations, such as Wassermann tests, Roentgen examinations, blood sedimentation tests, were performed as indicated and as cooperation was procurable. Urinalyses constituted an item in routine procedure. After actual examinations, the physician recorded a summary of significant deviations from the normal. Following this, all records were scored, irrespec-

tive of the examiner's impressions, in terms of precreated standards for ten age groups. Lastly, compilation data were obtained through the use of the statistical machines of the International Business Machines Corporation, with some consideration for probable errors and loadings. The per capita time consumption was in one series ten hours, and in two series two hours and twenty minutes. The time in contact with the examinee was in one series four hours, and in two series one hour.

FINDINGS IN THE CARDIO-VASCULAR SYSTEMS

In these compilations caution has been regarded as a requisite, and has been fully exercised in avoiding rigid diagnoses of such conditions as "myocarditis", "aortitis", "valvular heart disease", etc. Wherever such terminology has been applied, the conditions have been clear cut and the totals represent only a low percentage of possible lesser degrees of these abnormalities. The prime purpose in this study has been to detect significant deviations from the normal and encroachments upon the cardio-vascular reserves. Although we have excluded from significance such items as extra-systoles, sinus arhythmias, irregularities in rates, some tachycardias, minor arterio-sclerosis, and trivial or questionable hypertrophies, we regard all of these manifestations as warnings of possible incipient stages of significant abnormality.

In the following tables and charts we have abridged the more important cardio-vascular findings and correlations found in eighty tables in the basic reports on which this report is based.

COMMENT ON STATISTICAL COMPLICATIONS

The facts shown in the preceding tables have yielded incidence rates for cardio-vascular conditions apparently in excess of the findings from some other studies. Unfortunately, it is impossible to make just comparisons on a

basis of parity between the several major investigations of the physical status of supposedly well persons. Frequently, this situation is due to the failure of the examiners to classify findings on the basis of age groupings, which, obviously, sharply limits their value. The reports of Sydenstricker and Britten (5) are based on analyses of a selected group of males embracing only about 1.3 per cent. of workers on the social and economic level (train dispatchers excepted) represented in the present study. The depiction of defects found among army draftees by Love and Davenport (6) is necessarily limited to restricted and youthful age periods. The ten thousand industrial workers making up the sample analyzed by Britten and Thompson (7) include approximately 70 percent of persons of foreign birth or negroes. Such variables as these, while in no wise reflecting upon the merits of the compilations, tend to limit comparisons on any basis of equality of samples. Therefore, it may develop that our rates for cardio-vascular abnormalities are not out of proportion to other examinations made under identical circumstances.

If, in fact, our results indicate a greater frequency of cardio-vascular deviation from the normal, explanation may be found in our attachment of importance to cardiac enlargement, even in moderate degree, as evidence of taxation of the cardiac reserve. Of this, Stroud (8) states:—"The truest estimate of the extent of the encroachment upon the myocardial reserve is to be gained from a determination of the extent of the enlargement of the heart." Earlier he states: "............it is impossible to over-emphasize the importance of a correct estimation of the myocardial reserve, for it is mainly upon this that satisfactory prognosis and treatment depend. ...." Again, "............In reviewing the literature of fifteen or twenty years ago, one cannot but be impressed with the importance then placed upon murmurs, and the intensity or character of the cardiac sounds in prognosticating the future of a diseased heart. Even today, the

average student, be he graduate or undergraduate, upon visiting a heart clinic seems most interested in listening to, and in discussing, the character and importance of murmurs........." "Certainly murmurs are of importance, and their depreciation is being overdone by many clinicians, but an attempt should be made to seek the middle ground and give them their relative importance as in estimating that which most of all we wish to know—the myocardial reserve."

Perusal of the three basic reports, upon which this special report is formed, will reveal in that group (factory workers), in which cardio-vascular abnormality is least, the highest incidence of grossly bad oral conditions, infected tonsils, dermatoses, and joint conditions suggestive of infection. In some measure offsetting this state of affairs, it may be maintained that among clerical workers there has been a certain amount of self selection of easier jobs. This, however, does not apply to train dispatchers, in which group cardio-vascular impairments reached amazing numbers, for these men are selected by railroad officials from telegraphers and towermen on the basis of durable and rugged qualifications.

Excessive weights, long known to the insurance world as a salient factor in the abetment of cardio-vascular disease, has contributed to the excessive rates observed in both office workers and train dispatchers. Obesity does not characterize the factory worker.

In the office workers, and in the factory workers, the youthful and underweight examinee was prone to present hypotension. While certain degrees of low blood pressure are rated as significant cardio-vascular deviations, we do not, on a quantity basis, accept this condition as on a parity with essential hypertension. In late decades, hypotension has been frequently observed.

In the graphs prepared for the three basic studies, there recurs, with remarkable frequency in the decade from 55 to 65 years of life, a decided notch in otherwise ascending curves. Recognizing that our samples are truly small when

subdivided on a basis of age and notably in late life, this deviation in trends was early accepted as accidental. When, however, this same betterment reappeared in the other groups in the same life periods, we attached greater significance. Further inquiry may show that through an elimination process due to deaths, survivors near 65 years are physically superior to the total group near 55 years of age.

Some significance has been attached by cardiologists to the duration of breath holding time as an index of cardio-vascular abnormality. It has been stated that those persons unable to stop breathing for as much as 35 seconds should be examined with additional care for abnormality in this field. In one series of 1,000 examinees, it was noted that only 63 per cent. of the total group held their breath for 35 seconds, or longer, upon request; and that 50 per cent. of all persons rated as having cardio-vascular abnormality were in this group. The inference is that breath holding time with this standard does not afford helpful information as to cardio-vascular dysfunction.

In this work the pulse pressure of 50 mm. or more, has been rated as of probable pathological significance. Using this standard, 28.8 per cent. of the 1,000 factory workers presented this deviation, while 58.7 percent of the train dispatcher group exhibited this abnormality.

Among train dispatchers, 85.3 per cent. presented heart rates in excess of 80. Heart rates at the end of the work period were consistently normal for all persons, and for those individuals examined before and after work.

Findings from urinalyses have not proven of outstanding worth in connection with the detection of cardio-vascular disease, although among train dispatchers, the group in which cardio-vascular abnormality is outstanding, definite urinary findings of positive character have likewise been highest.

Reference to maps of this country, showing by states the relative mortality rates from heart disease, will establish

that with few exceptions all our examinations have been made in that zone providing the highest death rates from this cause (above 180 per 100,000). With the exception of certain New England States, this zone is characterized by greater density of population. Urban death rates (1914-1923) (9) for the registration area were 201 per 100,000 of population, in contrast to 153 for the same population unit for rural communities.

CAUSATIVE FACTORS IN INCREASING RATES OF CARDIO-VASCULAR ABNORMALITIES

Work, as a source of organic heart and blood vessel lesions, has been relegated by the cardiologists to a minor role. Likewise, the industrial physician and hygienist has been unable to produce, in the majority of industries, any acceptable evidence of appreciably higher rates of frequency, when full consideration is given to racial, social and economic influences. Wade Wright (10) has cited the report of the Registrar General of England and Wales for 1921-1923, as indicating that of 164 occupational classifications of males dying between the ages of twenty and sixty-five, only 16 classes presented significant standardized mortality rates, in excess of all occupied and retired males, for valvular heart disease, and only 21 classes for "Other Diseases of the Heart". Exceptions to this general situation are to be found in such occupations as involve exposure to siliceous dusts, lead compounds, and other specific intoxicants.

The concept that work is not a producer of heart and blood vessel degeneration is almost entirely linked up with excessive muscular work on a foot pound basis, such as may arise in the ditch digger, the boiler maker, the football player, or the Olympic runner. It is granted that scant proof exists that such work leads to cardio-vascular harm. On the other hand, there are forms of work, as well as other aspects of human life, that lead to continual trauma or indignities to the autonomic nervous system, that so influence the functions of visceral tissues as to culminate in organic

changes. It is the thesis of this paper that the cardio-vascular system may be organically involved in this process. As some evidence, we cite the nature and quantity of work of train dispatchers, together with the organic changes demonstrable in varied organs, notably the cardio-vascular system. The train dispatcher occupies the spearhead position in all train movements. He, at his desk, is responsible for all orders relative to freight, passenger and work trains. He it is that carries the burden of safety of the traveling public and train crews against catastrophes. In addition, he is responsible for the legal enforcement of hours of labor of crews, for watering of animals, and for such multitudinous duties as to tonnage, engine types, freight pickup, standard time, relief for wrecks, and replacement of damaged equipment. Some idea of the taxation of the train dispatcher's capacities may be grasped in pointing out that as he sits at his desk with phone receiver over his ear or sounder near-by, as many as two hundred items per hour come to him for record or decision. Many, but not all of these items, involve the life or death of human beings. Decisions in such matters must be made in terms of seconds in the midst of other and diverting matters in a work room at times so noisy as to constitute a din. Under frequent, but by no means regular conditions, the train dispatcher, during his entire eight-hour work trick, may not leave his desk or remove his ear phone receiver.

As a result of these things, the train dispatcher presents a sixty-seven percent incidence of occupational nystagmus, a fifty-two percent of occupational deafness, largely in his phone ear—the left, a high incidence of telegrapher's paralysis among older men who formerly operated by the Morse system, and among a smaller number who still so function. In this city (New York) 65% of 44 train dispatchers exhibited albuminuria in some degree. To these conditions add the findings already presented as to cardio-vascular abnormality, in which hypertension and cardiac enlargement

play significant parts. In addition to these organic manifestations, train dispatchers present neuroses and neurotic symptoms, such as intention tremors, blepharospasm, tachycardia, vasomotor disturbances, hyperhidrosis, functional gastric impairments, frequent urination, breathlessness and anxiety.

The average train dispatcher enters upon his duties, relatively, late in life, near 32 years of age, and on the basis of 442 deaths in the past 12 years, lies dead at the average age of 50.17 years.

Having ruled out any high prevalence of syphilis through Wassermann Tests on 44 consecutive train dispatchers examined, and by careful clinical observations, and having ruled out a higher frequency of other infections than may be expected to obtain in all males of comparable age, social, and economic status by careful history taking and clinical observations, we are prompted to believe, from all our findings, that portions of this unusual extent of organic cardiovascular abnormality are the results of prolonged, overwhelming mental strain.—IN SHORT ORGANIC IMPAIRMENT FROM MENTAL TRAUMA.

This concept of the source of certain instances of cardiovascular disease is not wholly new, and is detectable in the trend of recent and contemporary opinion. Dublin (11) states:— "The nervous mechanism which regulates the heart action may be temporarily and slightly deranged, producing heart symptoms without causing structural changes in the heart. Emotional states and severe bodily exercise will increase the demands on the circulation and overstrain the heart. The symptoms in such cases are sometimes very distressing, but usually are of no very great importance. If they are allowed to continue for long periods of time, however, these functional disorders may result in permanent heart impairment." Greiwe (12) states:— "It is evident that no true concept can ever be gained of the question of blood pressure and hypertension unless one acquaints him-

self with the autonomic nervous system ....". Later he states:— "........... When we come to consider the pathological anatomy associated with states of hypertension, we may say that in that type which is known as essential hypertension, we are at first dealing with what we are justified today in calling a neurosis, for the reason that no definite anatomic changes can be detected until the disease has existed for some years ...."

Krogh (13) estimates that the total surface of capillaries within muscle tissues alone approximates 69,000 square yards, and that the total length of capillaries again in muscle walls approximates 60,000 miles. If to these astonishing figures there be added corresponding ones for all other tissues, it must be granted that a tremendous lake or reservoir exists in all parts of the body. It is unlikely that more than 10 per cent. of capillaries in muscles are filled at any one time, but under the influence of various types of autonomic stimuli, there takes place a surge from essentially complete filling to relative emptiness. There can be no warranted doubt that such a situation, which is presented only as an example of several, has an important bearing on immediate blood pressure resulting in ultimate organic changes. Further it is difficult to believe that these changes in capillaries limit their influence to concomitant changes in blood pressure. The heart, the larger arteries, the veins, and the capillaries are all interdependent, and share in the results of whatever stimuli reach any one portion.

From the field of psychology there is coming much evidence in support of clinical significance of the autonomic nervous system defection. Industrial fatigue, long associated with the muscular system, is shifting to the autonomic and central nervous systems. More fatigue may be caused a workman in ten seconds if his machine explodes, than would be caused by 24 hours steady work at the machine under normal, heavy, muscular work.

Christian (14) relates that in his clinic 61 percent of all cardiac patients present chronic non-valvular heart disease, without a history of rheumatic fever, and without frequency of syphilitic history of importance. In these conditions he continues—"Usually there is cardiac hypertrophy and dilation, rarely an interstitial (fibrous) myocarditis .... Microscopically, there may be evidences of degenerative changes in the muscle fibers, but in the majority of cases the microscope reveals no change other than hypertrophy of the fibers." Cloetta (15) indicates a shift in his position when he voices the following:— "............Contrary to the former conception, I now consider every heart with dilation and hypertrophy as in an abnormal state and of diminished efficiency ...." Recently the term "myocardosis" has come into being (Reisman (16) Hyman and Parsonnet (17)), as descriptive of non-inflammatory varieties of heart disorders. The psychic factors in cardiac disorders form the basis of a recent publication by Conner (18).

Behind these contemporary publications indicative of a modification of the present day beliefs as to the etiologic factors of cardio-vascular abnormalities, stands the classical investigative work in the field of the autonomic nervous system of Cannon, Eppinger, Mueller, Krogh, and of others. To them a full measure of praise is due.

In contending that long continued abnormal stimulation of the exceedingly responsive autonomic nervous system may eventuate in visceral organic changes, it is desirable that I point out that while The Heart Council of Cincinnati has sponsored this work, that body may not concur in my interpretation of etiologic factors. If, however, from this paper and others that precede and may follow there may be an acceptation of the concept of organic changes resulting from long sustained and numerous emotional reflex stimuli, we then possess an adequate explanation of increasing numbers of bodily dysfunctions in which cardio-vascular lesions are now playing a disturbing part.

REFERENCE SHEET

(1) "LIFE CONSERVATION STUDIES", I. Physical Impairment Among Office Workers: (A statistical report based on complete physical examination of 1,000 men in office groups.)

by The Heart Council of Greater Cincinnati, June, 1929.

(2) " II. Physical Impairment Among Industrial Workers: (A report based on the complete physical examination of 1,000 white, male machine and hand tool operators.)

by The Heart Council of Greater Cincinnati, June, 1930.

(3) " III. The Physical Examinations of 1,000 Male Negroes in Factory Work. (This study has not as yet been published.)

by The Heart Council of Greater Cincinnati. – – –

(4) "PHYSICAL AND MENTAL IMPAIRMENT AMONG TRAIN DISPATCHERS". The American Train Dispatcher Association, 1930.

(5) Sydenstricker, Edgar, M. D., and Britten, Rollo H., M. D. *"THE PHYSICAL IMPAIRMENTS OF ADULT LIFE, GENERAL RESULTS OF A STATISTICAL STUDY OF MEDICAL EXAMINATIONS BY THE LIFE EXTENSION INSTITUTE OF 100,924 WHITE MALE LIFE INSURANCE POLICY HOLDERS SINCE 1921."

*Studies in the diseases of adult life No. 1, from the Division of Research, Milbank Memorial Fund.

THE AMERICAN JOURNAL OF HYGIENE, Vol. XI, No. 1, January, 1930.

(6) Love, Albert G., M. D., and Davenport, Charles B. Referred to in (5). "DEFECTS FOUND IN DRAFTED MEN." War Department, 1920.

(7) Britten, Rollo H., M. D., and Thompson, L. R., M. D. — "A HEALTH STUDY OF TEN THOUSAND MALE INDUSTRIAL WORKERS."

A Statistical Analysis of Surveys in Ten Industries.

Bull. No. 162 TREASURY DEPARTMENT U. S. Public Health Service, June, 1926.

(8) Stroud, W. D., M. D. — "THE IMPORTANCE AND THE MOST SATISFACTORY CLINICAL METHODS OF ESTIMATING THE MYOCARDIAL RESERVE."

American Heart Journal, Vol. 1, No. 3, February, 1926.

(9) Whitney, Jessamine S., M. D. — "HEART DISEASE MORTALITY STATISTICS."

American Heart Association, 370 Seventh Avenue, New York, May, 1927.

(10) Wright, Wade, M. D. — "MORTALITY AND MORBIDITY FROM HEART DISEASE UNDER INDUSTRIAL AND GROUP INSURANCE."

The American Heart Journal, Vol. 4, No. 4, p. 448, April, 1929.

(11) Dublin, Louis I., Ph. D. Statistician, Metropolitan. — "HEALTH AND WEALTH." A Survey of the Economics of World Health.

Published by Harper & Brothers, New York, 1928.

(12) Greiwe, John E., M. D. — "BLOOD PRESSURE."

Journal of Medicine, Cincinnati, Ohio, April, 1930.

(13) Krogh, August, Ph. D. — "THE ANATOMY AND PHYSIOLOGY OF CAPILLARIES."

Yale University Press, New Haven, Connecticut, 1922.

(14) Christian, Henry A., M. D. — "CHRONIC NON-VALVULAR HEART DISEASE, ITS CAUSES, DIAGNOSIS, AND MANAGEMENT."

Published in Medical Insurance, Vol XLVI, No. 1, July, 1930.

(15) Cloetta, Max., M. D. — See Reference (14).

"THE BIOCHEMICAL ACTION OF DIGITALIS."

Journal of American Medical Assn., Vol. 93, No. 19, p. 1462, November 9, 1929.

(16) Reisman. — See Reference (17).

(17) Hyman, Albert S., M. D., and Parsonnet, Aaron E. — "MYOCARDOSIS." Journal of A. M. A., Vol. 94, No. 21, p. 1645, May 24, 1930.

(18) Conner, Lewis A., M. D. — "PHYCHIC FACTOR IN CARDIAC DISORDERS."

Journal of A. M. A., Vol. 94, No. 7, February 15, 1930.

TABLE I. SIGNIFICANT CARDIO-VASCULAR ABNORMALITIES.

	Examinees with Significant Deviations from Normal			Percent of Total Examined			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	8	14	0	19.5	15.9	0	41	88	0
25–29	12	26	3	16.4	13.1	100.0	73	199	3
30–34	29	45	6	24.0	24.6	60.0	121	183	10
35–39	48	50	18	21.9	28.4	75.0	219	176	24
40–44	52	43	32	33.8	34.1	76.2	154	126	42
45–49	53	30	28	41.1	41.7	93.3	129	72	30
50–54	55	44	21	52.4	60.3	84.0	105	73	25
55–59	55	24	14	66.3	57.1	87.5	83	42	15
60–64	30	17	10	62.5	80.9	91.0	48	21	11
65–+	19	17	3	70.4	85.0	75.0	27	20	4
Total	361	310	135	36.1	31.0	81.8	1000	1000	165

TABLE II. SIGNIFICANT CARDIAC HYPERTROPHY.

Age Group	Examinees with Significant Cardiac Hypertrophy			Percent of Total Examined			Total in Group		
	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	1	1	0	2.4	1.1	0	41	88	0
25–29	1	4	2	1.4	2.0	66.7	73	199	3
30–34	3	4	2	2.5	2.2	20.0	121	183	10
35–39	11	8	7	5.0	4.5	29.2	219	176	24
40–44	11	11	14	7.1	8.7	33.3	154	126	42
45–49	11	9	17	8.5	12.5	56.7	129	72	30
50–54	27	14	11	25.7	19.2	44.0	105	73	25
55–59	30	8	3	36.1	19.1	18.7	83	42	16
60–64	17	8	5	35.4	38.1	45.4	48	21	11
65–+	10	8	1	37.0	40.0	25.0	27	20	4
Total	122	75	62	12.2	7.5	37.6	1000	1000	165

TABLE III. HYPERTENSION.

	Examinees with Hypertension			Percent of Total Examined			Total with Significant Heart Lesions			Percent of Total Examined			Percent of Total c Significant Heart Lesion having Hypertension			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25–	1	4	0	2.4	4.5	0	8	14	0	19.5	15.9	0	12.5	28.6	0	44	88	0
25–29	2	10	1	2.7	5.0	33.3	12	26	3	16.4	13.1	10.0	16.6	38.6	33.3	73	199	3
30–34	3	7	1	2.5	3.8	10.0	29	45	6	24.0	24.6	60.0	10.3	15.6	16.7	121	183	10
35–39	14	7	4	6.4	3.6	16.7	48	50	18	21.9	28.4	75.0	29.2	14.0	22.2	219	176	24
40–44	16	10	8	10.4	7.9	19.0	52	43	32	33.8	34.1	76.2	30.7	23.2	25.0	154	126	42
45–49	27	11	13	20.9	15.3	4.3	53	30	28	41.1	41.7	93.3	50.9	36.7	46.4	129	72	30
50–54	20	20	9	19.0	27.4	36.0	55	44	21	52.4	60.3	84.0	36.4	45.5	42.8	105	73	25
55–59	24	10	6	26.5	24.8	37.5	55	24	14	66.3	57.1	87.5	40.0	41.6	42.8	83	42	16
60–64	13	5	6	27.1	23.8	54.5	30	17	10	62.5	80.9	91.0	43.3	29.4	60.0	48	21	11
65-+	11	7	1	40.7	35.0	25.0	19	17	3	70.4	85.0	75.0	57.9	41.2	33.3	27	20	4
Total	131	91	49	13.1	9.1	29.7	361	310	135	36.1	31.0	81.8	35.7	29.4	36.3	1000	1000	165

TABLE IV. HYPOTENSION.

	Examinees with Hypotension			Percent of Total Examined			Total with Significant Heart Lesions			Percent of Total Examined			Percent of Total c Significant Heart Lesion having Hypotension			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25–	5	5	0	12.2	5.7	0	8	14	0	19.5	15.9	0	62.5	35.7	0	41	88	0
25–29	3	9	0	4.1	4.5	0	12	26	3	16.4	13.1	100.	25.0	34.6	0	73	198	3
30–34	18	26	2	14.8	14.2	20.0	29	45	6	24.0	24.6	60.0	62.0	57.8	33.3	121	183	10
35–39	23	25	1	10.5	14.2	4.2	48	50	18	21.9	28.4	75.0	47.9	50.0	5.6	219	176	24
40–44	22	25	4	14.3	19.8	9.5	52	43	32	33.8	34.1	76.2	42.3	58.1	12.5	154	126	42
45–49	16	5	3	12.4	6.9	10.0	53	30	28	41.1	41.7	93.3	30.1	16.6	10.7	129	72	30
50–54	20	13	1	19.0	17.8	4.0	55	44	21	52.4	60.3	84.0	36.3	29.5	4.7	105	73	25
55–59	13	7	4	15.6	16.7	25.0	55	24	14	66.3	57.1	87.5	23.6	29.1	28.5	83	42	16
60–64	4	4	0	8.3	19.0	0	30	17	10	62.5	80.9	91.0	13.3	23.5	0	48	21	11
65-+	0	4	0	0.0	20.0	0	19	17	3	70.4	85.0	75.0	0.0	23.5	0	27	20	4
Total	124	123	15	12.4	12.3	9.1	361	310	135	36.1	31.0	81.8	34.3	39.7	11.1	1000	1000	165

TABLE V. PULSE PRESSURES.

Age Group	Examinees with pulse pressure of less than 30 mm.			Examinees with pulse pressure of 30–49 mm.			Examinees with pulse pressure of 50 or more mm.			Total in Group		
	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	..	1	0	..	57	0	..	30	0	..	88	0
25–29	..	5	0	..	150	1	..	44	2	..	199	3
30–34	..	5	1	..	144	1	..	34	2	..	183	4
35–39	..	5	1	..	134	9	..	37	7	..	176	17
40–44	..	4	2	..	91	12	..	31	18	..	126	32
45–49	..	1	0	..	45	11	..	26	14	..	72	25
50–54	..	3	0	..	36	4	..	34	15	..	73	19
55–59	..	1	1	..	12	4	..	29	5	..	42	10
60–64	..	0	0	..	8	1	..	13	6	..	21	7
65–+	..	0	0	..	10	2	..	10	2	..	20	4
Total	..	25	5	..	687	45	..	288	71	..	1000	121
Percent	..	2.5	4.1	..	68.7	47.1	..	28.8	58.6	..		

TABLE VI. VALVULAR LESIONS*.

	Examinees with Valvular Lesions			Percent of Total Examined			Total with Significant Heart Lesions			Percent of Total Examined			Percent of Total c Significant Heart Lesions having Valvular Lesions			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	1	2	0	2.4	2.3	0	8	14	0	19.5	15.9	0	12.5	14.3	0	41	88	0
25-29	4	3	1	5.5	1.5	33.3	12	26	3	16.4	13.1	100.	33.3	11.5	33.3	73	198	3
30-34	5	4	3	4.1	2.1	30.0	29	45	6	24.0	24.6	60.0	17.2	8.9	50.0	121	183	10
35-39	6	5	5	2.7	2.8	20.8	48	50	18	21 9	28.4	75.0	12.5	10.0	27.8	219	176	24
40-44	6	0	11	3.9	0	26.2	52	43	32	33.8	34.1	76.2	11.5	0	34.4	154	126	42
45-49	6	3	11	4.7	4.2	36.7	53	30	28	41.1	41.7	93.3	11.3	10.0	39.3	129	72	30
50-54	7	1	6	6.6	1.4	24.0	55	44	21	52.4	60.3	84.0	12.7	2.3	28.5	105	73	25
55-59	6	0	5	7.2	0	31.2	55	24	14	66.3	57.1	87.5	10.9	0	35.7	83	42	16
60-64	3	4	6	6.2	19.0	54.5	30	17	10	62.5	80.9	91.0	10.0	23.5	60.0	48	21	11
65-+	6	1	1	22.2	5.0	25.0	19	17	3	70.4	85.0	75.0	31.6	5.8	33.3	27	20	4
Total	50	- 23	49	5.0	2.3	29.6	361	310	135	36.1	31.0	81.8	13.8	7.4	36.2	1000	1000	165

*Possibly includes some functional murmurs.

TABLE VII. SIGNIFICANT HEART LESIONS IN RELATION TO OVERWEIGHT.

	Examinees with Significant Heart Lesions			Percent of Total Examined			Examinees with Overweight			Examinees with Overweight having Significant Heart Lesions			Percent of All Significant Heart Lesions			Total in Group		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	8	14	0	19.5	15.9	0	4	6	0	1	0	0	12.5	0	0	41	88	0
25-29	12	26	3	16.4	13.1	100.	13	43	1	2	6	1	16.6	23.0	33.3	73	199	3
30-34	29	45	6	23.9	24.5	60.0	24	42	4	5	10	0	17.2	22.2	0	121	183	10
35-39	48	50	18	21.9	28.4	75.0	84	61	10	23	19	6	47.9	38.0	33.3	219	176	24
40-44	52	43	32	33.7	34.1	76.1	65	54	21	20	22	12	38.4	51.1	37.5	154	126	42
45-49	5[illegible]	30	28	41.0	41.1	93.3	67	40	14	26	21	12	49.0	70.0	42.1	129	72	30
50-54	55	44	21	52.3	61.1	84.0	70	48	15	37	31	10	67.2	70.4	47.6	105	73	25
55-59	55	24	14	66.2	57.1	87.5	55	30	10	37	17	5	67.2	70.8	35.7	83	42	16
60-64	30	17	10	62.5	80.9	90.9	25	13	8	18	10	4	60.0	58.8	40.0	48	21	11
65-+	19	17	3	70.3	85.0	75.0	15	9	2	14	8	1	73.6	47.0	33.3	27	20	4
Total	361	310	135	36.1	31.0	81.8	422	346	85	183	144	51	50.6	46.4	37.7	1000	1000	165

TABLE VIII. HISTORY OF PAST ILLNESSES.

	No History			Tuberculosis			Scarlet Fever			Malaria			Rheumatism			Venereal		
Age Group	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
Below 25	1	6	0	1	1	0	7	10	0	2	1	0	5	7	0	6	14	0
25–29	4	7	0	2	0	0	6	21	0	1	15	0	7	14	1	4	33	1
30–34	2	6	0	3	2	0	20	16	2	9	2	3	18	16	1	9	31	1
35–39	3	8	0	5	6	0	20	16	3	33	13	4	45	18	3	43	19	9
40–44	3	12	2	5	1	2	34	11	4	19	10	5	36	9	8	33	18	6
45–49	3	5	0	3	1	2	19	2	4	14	13	8	42	6	7	24	14	5
50–54	4	5	0	1	2	0	16	3	4	12	6	5	37	7	4	31	12	3
55–59	1	1	0	2	0	0	18	5	1	15	6	4	40	4	1	26	6	2
60–64	2	2	0	1	1	0	6	1	2	12	5	4	19	5	1	15	6	1
65-+	3	3	0	0	0	0	4	0	0	4	3	1	13	2	0	8	0	4
Total	26	55	2	23	14	4	150	85	20	121	74	34	262	88	26	199	153	32

TABLE VIII—(continued).

Diphtheria			Typhoid Fever			Tonsillitis			Neuritis			Nervous Brk.			Migraine		
Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
6	4	0	3	7	0	17	24	0		2		0	1	0	10	0	0
7	19	0	9	16	2	31	71	2		7		1	3	0	17	1	0
13	10	0	17	24	0	56	55	1		7		9	2	0	27	0	0
14	7	0	49	23	2	94	36	3		8		13	5	1	55	1	1
25	17	2	30	23	10	51	26	10		9		11	6	7	30	1	8
16	6	4	26	19	9	40	13	9		9		9	3	3	18	0	3
13	6	1	25	16	3	41	14	5		5		13	3	1	27	0	2
11	3	1	23	16	0	28	3	3		5		8	6	1	23	1	2
6	0	1	11	5	1	13	4	1		3		6	2	0	7	1	2
0	0	0	2	2	1	4	1	1		2		4	0	1	8	0	0
111	72	9	195	141	28	375	247	35		57		74	31	14	222	5	18

TABLE VIII—(continued).

Pneumonia			Measles			Whooping Cough			Influenza			Occup. Disease			Others		
Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.	Off. Wks.	Fac. Wks.	Disp.
4	13	0	32	67	0	22	53	0	9	44	0	0	0		31	62	0
6	26	2	50	158	2	36	96	2	14	102	0	0	0		68	130	4
12	28	0	90	143	4	57	98	3	27	74	2	0	1		122	121	11
25	20	4	169	136	13	105	89	11	48	89	1	1	0		225	107	29
21	16	4	128	86	25	75	52	20	29	56	7	1	0		149	71	52
17	11	5	4	51	23	64	27	15	26	26	4	0	0		128	40	39
15	3	3	67	46	16	51	31	11	23	25	1	0	1		103	45	29
7	7	2	65	30	9	38	16	6	17	17	1	1	0		80	22	18
5	1	2	26	14	5	18	12	3	5	6	0	2	0		42	10	9
1	2	0	13	10	3	9	6	3	4	6	1	2	0		20	10	8
113	127	22	644	741	100	475	480	74	202	445	17	7	2		968	618	199

TABLE IX. SIGNIFICANT HEART LESIONS IN RELATION TO HISTORY OF RHEUMATISM AND TONSILLITIS.

	Examinees with Significant Heart Lesions		Percent of Total Examined		Examinees with Significant Heart Lesions and History of Rheumatism		Percent of Total Examined		Examinees with Significant Heart Lesions and History of Tonsillitis		Percent of Total Examined		Total in Group	
Age Group	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.	Off. Wks.	Fac. Wks.
Below 25–	8	14	19.5	15.9	2	1	4.9	1.1	2	3	4.9	3.4	41	88
25–29	12	26	16.4	13.1	2	5	2.7	2.5	5	11	6.8	5.5	73	199
30–34	29	45	24.0	24.6	2	6	1.6	3.3	18	14	14.9	7.7	121	183
35–39	48	50	21.9	28.4	14	6	6.4	3.4	19	9	8.6	5.1	219	176
40–44	52	43	33.8	34.1	11	2	7.1	1.6	12	7	7.8	5.6	154	126
45–49	53	30	41.1	41.7	23	3	17.8	4.2	15	5	11.6	6.9	129	72
50–54	55	44	52.4	60.3	20	4	19.0	5.4	25	8	23.8	10.9	105	73
55–59	55	24	66.3	57.1	26	3	31.3	7.1	18	2	21.7	4.7	83	42
60–64	30	17	62.5	80.9	10	5	20.8	23.8	9	4	18.8	19.0	48	21
65-+	19	17	70.4	85.0	8	2	29.6	10.0	3	1	11.1	5.0	27	20
Total	361	310	36.1	31.0	118	37	11.8	3.7	126	64	12.6	6.4	1000	1000

TABLE X. GENERAL MENTAL SUMMARY*.

	Examinees with Normal Mental Status	Percent of Total Examined	Examinees with slight Deviations from Normal Mental Status	Percent of Total Examined	Examinees with significant Deviations from Normal Mental Status	Percent of Total Examined	Total in Group
Age Group	Dispatchers		Dispatchers		Dispatchers		Dispatcher
Below 25	0	0.0	0	0.0	0	0.0	0
25–29	1	33.3	1	33.3	1	33.3	3
30–34	1	25.0	3	75.0	0	0.0	4
35–39	4	23.5	7	41.1	6	35.2	17
40–44	10	31.2	16	50.0	6	18.7	32
45–49	8	32.0	8	32.0	9	36.0	25
50–54	6	31.5	10	52.6	3	15.7	19
55–59	5	50.0	4	40.0	1	10.0	10
60–64	5	71.4	1	14.2	1	14.2	7
65–+	2	50.0	1	25.0	1	25.0	4
Total	42	34.7	51	42.2	28	23.2	121

*Based on psychiatric and neurologic examinations, together with results from Otis Mental Test, Laird Mental Inventory, Word Association Tests, and history of mental or nervous abnormality.

UNITED STATES PUBLIC HEALTH SERVICE

RUPERT BLUE, Surgeon General

PHYSICAL EXAMINATION OF WORKERS

BY

J. W. SCHERESCHEWSKY
Surgeon, United States Public Health Service

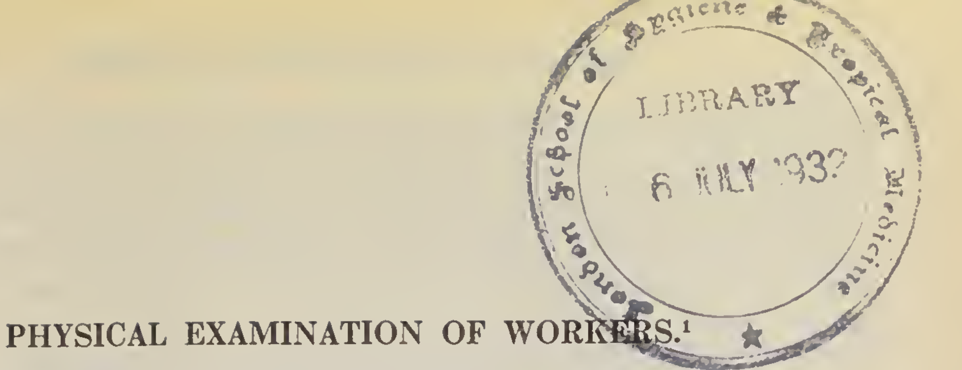
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PHYSICAL EXAMINATION OF WORKERS.[1]

By J. W. Schereschewsky, Surgeon, United States Public Health Service.

The spirit of individualism is rapidly passing out of modern society, to be replaced by an increasing solicitude for methods which aim at greater cooperation between various social units, the better conservation of human life and health, and an increasing recognition of the importance of the individual to society at large.

We are gradually coming to a realization of the fact that continued industrial prosperity is not dependent, in the last analysis, upon the tons of raw material consumed nor the money value of the finished product, but upon the physical efficiency of the worker and the length of the period of his economic productivity.

There can be no question that the value of the individual to society is conditioned more by the length of this period than any other factor. The stage of growth and development from infancy to manhood is at a heavy, though rightful, cost to society, a cost which is becoming larger from year to year, because of the increased pains taken and skill exercised to insure the greater efficiency of the finished human product and the longer time devoted to this end. During his years of economic productivity the individual repays this debt to society.

It is evident that the returns from these human investments are variable. Some return manifold the cost, others increase greatly this debt. The most important factor determining the economic return the social unit shall make consists in the condition of his health. The maintenance of a continuous state of physical efficiency is the best guarantee that each social unit shall easily and abundantly discharge his debt to society.

Few of us have any accurate realization of the enormous losses caused each year in all industries by the ill health of workers, for the most part due to preventable causes. In a recent address by Dr. L. K. Frankel,[2] of the Metropolitan Life Insurance Co., before the Detroit conference, it appears from the experience of the local sick benefit societies of Leipsic and vicinity in Germany, that the

[1] Read before the Session on Industrial Hygiene, Third Annual Congress of the National Council for Industrial Safety, Chicago, Ill., Oct. 12-15, 1914. Reprint from the Public Health Reports, vol. 29, No. 47, Nov. 20, 1914.

[2] Dr. L. K. Frankel: Occupational Hygiene, Appendix A, Detroit conference, Niagara Falls, Sept. 4, 1914.

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annual loss from sickness per 100 male workers in 83 occupations was 910 days, varying from 395 days in barbers and personal attendants to 1,574 days in cardboard and paper-box factory workers. In female workers the loss was still higher, varying from 560 days in bookkeepers and office employees to 1,978 days in workers in skins, hides, and other animal refuse, the average being 1,138 days.

In 1910 the First National Conference on Industrial Diseases[1] addressed a memorial to the President of the United States, in which it was stated that there occurred annually in the United States 13,400,000 cases of illness among workers, involving an economic yearly loss of nearly three-fourths of a billion dollars.

As a large part of this huge loss is preventable, it is clear that society is not fostering foolish fads nor indulging in vague humanitarianism by displaying active interest in the physical condition of its units. It is only natural, therefore, that the question of the physical examination of workers (or medical supervision, as I prefer to term it) should have attracted increasing attention in recent years.

It is my intention to discuss briefly the purpose of such medical supervision, its value, and the results we may expect in the future from the practical application of the useful data it can be made to provide.

We are, of course, well aware of the specific reasons for the introduction of the physical examination of workers in this country. The enactment of legislation for the compensation of workmen for injuries has rendered such examination advisable for the purpose of determining the physical condition of workmen upon entering employment, so that unjust claims for accidental injuries might be avoided, and the hazard to fellow employees, arising from physical defects in workers, reduced.

Begun on this basis, we are rapidly coming to the realization of the great value of such medical supervision in a larger sense. The beneficent results of the widespread campaign for safety have focused the attention of the industrial world in a way, possible in no other manner, to the very great importance of health in the abstract. We are beginning fully to recognize the fact that the very principle which renders it expedient to safeguard health and limb, renders it equally expedient, by extension, to safeguard the health of the worker from all standpoints.

In accordance with this principle, large industrial plants everywhere are beginning voluntarily to study industrial sanitation and to extend measures, originally intended solely to reduce accidents, so that they also serve to diminish the incidence of disease. They are realizing

[1] Dr. W. Gilman Thompson: The Occupational Diseases of Modern Life. Read before the annual meeting of the Cumberland County Medical Society, Portland, Me., Dec. 8, 1911, p. 2.

that, as it is their duty to minimize the effects of ignorance and carelessness in producing accidents, so, in similar fashion, the operation of these causes in the production of sickness should be reduced, as a person who is ill through carelessness or lack of knowledge is just as much a dependent upon society as one in the same condition from injury.

Let us now proceed to a discussion of the aims of such medical supervision. The goal to which we are evidently tending is to render all industries "safe." While certain hazards inherent in industries must necessarily be encountered, our object is to minimize their detrimental influence. In other words, we are subscribing to the principle that, *per se*, an industry ought not to exercise an unhealthful influence upon the worker; that occupation in that industry ought not to curtail the average period of economic productivity.

Suppose that all precautions have been taken to prevent the operation of injurious factors in a given industry; suppose that due care has been given to the sanitation of workrooms; suppose that the occurrence of accidents has been reduced to a minimum by proper rules, the safeguarding of machinery, and the education of the workers, have we done all we can or ought to do in the way of guarding the industry from economic loss through disabilities? The answer is, "No." We will achieve results far in advance of anything accomplished by the methods above described if, in addition to this, a system of medical supervision with periodic physical examinations of all employees be introduced. There can be no question that such examinations constitute the most efficient means at our command for maintaining the individual in a continuous state of physical efficiency.

As a general proposition such medical supervision should have for its objects the following points:

1. The prevention of the introduction, and the control, of communicable diseases among workers.
2. The detection of physical defects and diseases in their incipiency among workers.
3. The adaptation of the work to the physical condition of the worker.
4. Advice to the worker as to his own physical condition.
5. A careful record of the actual physical condition of workers.
6. The education of workers.
7. The prevention of occupational diseases.

We will now take up each one of these points for discussion.

1. *The control of communicable diseases.*—It would seem a matter of simple justice that the worker should be protected from exposure to infection from coworkers suffering from communicable diseases.

As an example of this, the Public Health Service was recently called upon to investigate, in a large steel plant, an outbreak of trachoma,

which, as you know, is a contagious disease of the eyes, frequently resulting in great impairment or loss of vision. The situation was found to be so acute that the company took immediate steps at large expense to eradicate the disorder, in view of the imminent spread of the disease throughout the factory personnel. A system of medical supervision, which, I am given to understand, this company has now adopted, would, in the first instance, have prevented this outbreak.

2. *The detection of incipient defects and diseases.*—Many individuals have their efficiency much impaired because they are suffering from some easily correctible defect the existence of which was unsuspected by them. Others are suffering from diseases, such as pulmonary tuberculosis, in an incipient condition which, if neglected, would make such advances as to preclude subsequent recovery. Medical supervision creates an opportunity for detecting such defects and diseases before the damage wrought is irreparable and of advising the worker of the steps which should be taken for their improvement or correction.

3. *Adaptation of the work to the physical condition of the worker.*—It is evident that some classes of work require certain physical qualifications or the absence of certain physical defects or diseases. It is obvious that persons suffering from hernia should not work at occupations which require the lifting of heavy objects, persons suffering from nephritis should not engage in occupations involving great fluctuations in temperature or exposure to cold and dampness, nor should persons suffering from cardiac disease be placed in situations where physical exertion is required, or where a sudden vertigo may endanger the individual or his coworkers. Medical supervision gives the needed opportunity of adjusting the duties of the individual to his physical capacities, so that the productiveness of the individual remains at a maximum compatible with his physical condition, without his being endangered or causing injury to others by reason of his infirmities.

4. *Advice to the worker.*—The great opportunity which medical supervision affords to advise workers concerning their physical condition is an advantage which can not be overestimated. The helpful interest thus displayed on the part of the employer toward the physical condition of workers awakens that spirit of cooperation on their part which is necessary to the maintenance of "safe" industrial conditions. Such, at least, has been the experience of plants in which medical supervision has been put in operation. In addition to this, workers should be encouraged to visit the plant hospital whenever they feel sick, so that, on the one hand, if the symptoms are serious, the worker can be advised to stop work before further injury has occurred, or, on the other, if the ailment be trivial, a minimum of time will be lost from work.

5. *Record of the physical condition.*—For proper medical supervision it is essential that careful records of the physical condition of workers be kept. In the first place a record of the physical examination serves, on the one hand, to safeguard against unjust claims for compensation in the case of injuries, while, on the other, a record of physical fitness will help to substantiate just claims for such injuries. In the second, such records constitute most valuable data for studying the average physique and the condition of the health of workers in any industry.

6. *Education of the workers.*—We are familiar with the excellent work already accomplished in the prevention of accidents by means of the education of workers. A similar campaign in teaching them how to keep well should have like effects in reducing the number of cases of illness.

7. *The prevention of occupational diseases.*—Systematic medical supervision is a most excellent agent to prevent the occurrence of occupational diseases among workers. When such diseases are found in a plant the first cases will be detected by the medical supervision, so that the sanitary defects responsible for them may be readily corrected. The supervision would serve also as a constant check upon the efficiency of the methods introduced to prevent the occurrence of occupational diseases.

Type of Physical Examination Contemplated.

Whatever is worth doing is worth doing well. The importance of making physical examinations thorough can not be overemphasized. A reliable record of the physical condition can not be obtained by a hasty and superficial examination; the data so collected are of no especial value, nor can incipient disease be detected by such methods. What is especially needed is a standard form of physical examination, so that the data obtained in this manner for various industries may be comparable.

Workers found suffering from physical defects and diseases should be held under observation and requested to report back for reexamination, so that advice as to their condition may be given, as well as a watch kept upon their progress to recovery. It is also earnestly recommended that periodic reexaminations be made of all workers, as this is the best way of insuring a continuous state of health on their part.

It is evident from the foregoing that the scheme of medical supervision contemplated in this paper is extensive and would entail considerable expense to put in operation. The question which inevitably arises is: "Will it pay?" The answer must be unhesitatingly in the affirmative. The experience of all plants in which such systems have been put in operation is so satisfactory that no doubt has arisen in the

minds of their officers that medical supervision does pay in increased efficiency of the working force, greater content of the workers, greater cooperation between employers and employed, and in greatly diminished loss of time and suffering from preventable disease.

There is another aspect of this question of medical supervision upon which I have not as yet dwelt. We are in need of more exact information in order to render our industries "safe" from a health standpoint. While it is manifestly wasteful to introduce superfluous precautions in industries, it is equally a part of social justice to see that such precautions be adequate. The physical examination of workers gives us information, which can be so well obtained in no other way, as to the diseases and defects peculiar to workers and the specific influence of occupations upon the health of the individual.

Let me illustrate this point: At present the Federal Public Health Service is entering upon a study of diseases of occupation. The first and most important question in the consideration of this subject is, naturally, What is the effect of different occupations upon the health of workers? The service is just concluding an investigation, undertaken at the solicitation of the Joint Board of Sanitary Control of the Garment Trades, in New York, as to the influence of this industry upon the health of its workers. The most important line of study which the service pursued in this investigation consisted of careful physical examination of several thousand garment workers. As a result of these physical examinations the Public Health Service is now in possession of rather precise data, obtainable so well in no other way, as to the effects of this occupation upon the health of the individual, the average physical condition of garment workers, the types of diseases, and disabilities from which the workers suffer. The service is, therefore, in a position to formulate useful recommendations for the sanitary improvement of this industry. These studies the service hopes to extend to other industries as facilities permit.

We see from the foregoing the great value of physical examinations of workers in obtaining accurate data as to the effects of industries upon health. The general introduction of systems of medical supervision, with periodic physical examinations in various industries, will result in the collection of a body of similar data, which, when studied, will form a logical basis for practical recommendations to make all such industries safe from a health standpoint. In other words, the medical supervision of workers, if generally introduced, will point clearly the way to enable each industry to sanitate itself. When we have reached this point it will be found that the enormous economic loss caused in industries by preventable diseases and disabilities will have largely disappeared.

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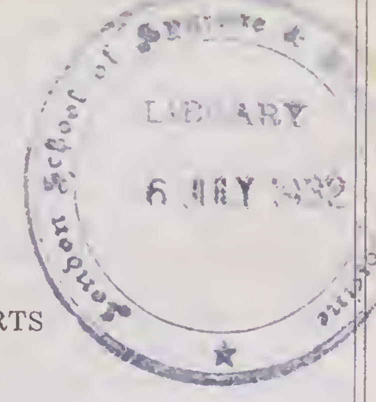
UNITED STATES PUBLIC HEALTH SERVICE
RUPERT BLUE, SURGEON GENERAL

INDUSTRIAL HYGIENE

A PLAN FOR EDUCATION IN THE AVOIDANCE OF OCCUPATIONAL DISEASES AND INJURIES

BY

J. W. SCHERESCHEWSKY
Surgeon, United States Public Health Service



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INDUSTRIAL HYGIENE.

A PLAN FOR EDUCATION IN THE AVOIDANCE OF OCCUPATIONAL DISEASES AND INJURIES.[1]

By J. W. Schereschewsky, Surgeon, United States Public Health Service.

It must be confessed that this subject is one to be approached in a spirit of diffidence for the reason that the results to be effected are so far-reaching and of such fundamental importance, the methods employed play such a leading part in the final result, and finally, the inauguration of any thorough plan of education will cost so much money, that the writer may well be excused for a tentative spirit in making suggestions.

There would hardly seem need for an extended discussion of the necessity for education in industrial hygiene and the avoidance of occupational complaints. There are approximately from 25,000,000 to 30,000,000 industrial workers in this country, all of whom are more or less exposed to health hazards. While many of these are the ordinary health hazards, present in the industrial as in any other sphere, on the other hand many of them are inherent to the occupation in question. There can be no question that the steady operation of these hazards exerts a deleterious influence upon the health of the individual, while many of them seriously menace life or curtail the period of productive activity.

One of the most important results effected by the present "Safety First" campaign is that our eyes have been opened to the fact that it is not sufficient to make industries "Safe" from an accident standpoint; they should be "Safe" from a health standpoint as well. In other words, no industry ought per se to exert an injurious influence upon the health of the worker; in no industry should occupation therein entail curtailment of the period of economic activity.

While in the absence of reliable statistics we can only approximate the average yearly loss through the sickness of workers, figures which have been published in Europe enable us reasonably to conclude that the average annual loss through sickness, to workers in this country, is not far from eight to nine days. This would amount to some 600,000 years each year, or an economic loss of $360,000,000 if average annual earnings are $600. The loss due to premature physical decline or to reduction in productivity, the result of the continuous operation of industrial health hazards, can not as yet be estimated. This can be arrived at only as a result of future studies which are highly necessary.

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[1] Read before the Section on Industrial Hygiene, American Public Health Association, Rochester, N. Y., September 7, 1915. Reprint from the Public Health Reports, vol. 30, No. 40, Oct. 1, 1915.

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A large part of the loss just adverted to is preventable and is due to lack of knowledge or to carelessness. It need hardly be said that the need for the conservation of human life and health was never more imperative than it is to-day. The gigantic destruction now going on daily in the vast conflict of European nations only emphasizes the urgency for methods of conservation of life and health. In addition to this, our attention is being repeatedly called to the alarming increase in the so-called "Diseases of degeneration." The conclusion seems inevitable that this increase can be due to nothing but the operation of modern conditions of civilization which have modified, more than in any other particular, the ways in which man gains his daily bread, i. e., industrial conditions.

Clearly there is need that something should be done. We all know, from the history of campaigns in the interest of the public health in the past, that education is one of our most effective means of improving health conditions. A more difficult question is the consideration of educational methods and the social groups to which this education should be directed. A short consideration will convince us that it will not be sufficient to educate workers alone. The field to be covered is more extensive. Not only must the worker be reached but educational measures must extend to the general public and to the medical profession.

Any plan for education must, therefore, be general in nature because of the close interdependence of all the units of society. Thus, the education of the medical profession is needed for the purpose of stimulating the interest in the study of diseases in relation to occupation, the improvement in collection of clinical data bearing upon occupational diseases, and the promotion of research work along those lines so that practical recommendations for advances in the sanitation of industries may result.

The education of the general public is required, first, because the history of all our constructive health legislation of the past shows that an enlightened public opinion is necessary to success, and, second, because it is impossible so to delimit the field of industrial hygiene as to separate it from the hygiene of the total environment. Moreover, employers of labor are an important class of the general public. Their cooperation is necessary if industrial health conditions are to be improved. Finally, the workers themselves are to be educated. In order to secure substantial improvement in the health conditions of industries, we must secure knowledge, on the part of the worker, of the general principles of industrial hygiene and the care of his own body. Otherwise provisions for his health and safety will, in the absence of his intelligent cooperation, be largely nullified.

Beginning with the medical profession, the recognized source of most of our hygienic information, it is only too plain that study of the relation of disease to occupation is regarded as a specialty and something with which neither the general practitioner nor the specialist in other fields is very closely concerned. Yet industrial workers constitute by far the largest class of medical patients. It is evident to anyone who examines the clinical records of the average hospital that with a wealth of material for study, with but rare exceptions, scant attention is paid, for the most part, to the relation of industrial health hazards and of occupational diseases to the morbid history of patients in such hospitals. Even the occupation of patients is im-

perfectly ascertained, the data on this point in most hospital histories being so vague and unreliable as to be practically valueless.

The influence of industries upon health is a subject which has been hitherto sadly neglected both in our medical curricula and at the bedside. There is therefore need to educate the medical profession to the importance of industrial hygienic measures and the study of the relation of occupations to diseases.

Inasmuch as hospitals are the chief sources of clinical material, and hence the natural locations where intensive studies of disease may be made, it is clear that here must begin the first steps in the education of the medical profession. As Hayhurst has pointed out, the first thing necessary to the utilization of hospitals as centers of education in industrial hygiene, is the adoption of a uniform nomenclature which will exactly designate the occupation of hospital patients. In taking histories, similar standards are required which will furnish information as to the previous industrial history of the patient and the relation, if any, of this to his previous or present morbid history. At all clinics for the instruction of medical students stress should be laid upon these points by the demonstrator so that all such students may gain an idea of the important bearing of such data upon disease.

It is also important that death certificates should correctly and exactly indicate the occupation of the decedent. The instruction of the medical profession in this matter is primarily the function of the registrars of vital statistics. There is room for improvement in the form of death certificates themselves in that these should provide more fully for the accurate description of the occupation besides permitting the notation of previous occupations and the time during which each was pursued. Accurate information of this kind would be invaluable in the study of the mortality of occupations.

The increase in the interest of study of the relation of occupation to disease produced in medical centers of instruction by the measures thus roughly indicated, even if carried out in a relatively small number of hospitals, could hardly fail to produce an accumulation of valuable information.

This, together with the interest aroused in the general medical profession, would not only be productive of useful suggestions for intensive research and the improvement of the hygiene of industries, but the importance of the study of the relation of occupation to disease would also become so well recognized that thorough instruction in this subject would be part of the regular curricula of medical schools. One important result would be an increase in the number of physicians qualified to undertake the medical care and supervision of large industrial plants.

Turning to the question of the education of the general public and of workers, this will be considered under one head for the reason that the latter is but a subdivision of the former. All are in need of education in these particulars, the only difference being that in the case of workers, the education should be somewhat more specific to suit the occupation followed.

It is plain that, while we may leave, to a certain extent, at least, the education of the medical profession to centers of medical instruction, some of which are recognizing the importance of instruction of this character, the education of so vast a body as the general public

must be the result of governmental cooperation, Federal, State, and municipal, allied with other civic agencies, such as associations formed for the betterment of industrial conditions and the trades unions of various industries.

Before any such cooperation can be effective to its fullest extent, there is certain preliminary work to be undertaken which, while it need not prevent the initiation of educational measures, will when completed add to their force and definiteness. By this preliminary work is meant the creation of uniform minimum standards of industrial sanitation and legislation. Inasmuch as the Federal Government is recognized as the standard-making agency par excellence in this country, it would seem that the formulation of the standards referred to is peculiarly the work of Federal authorities.

The adoption of such standards, once they are formulated, is of course the work of the legislative authority of the several States. The adoption of such standards, while not interfering with any additional precautions States or municipalities may see fit to enforce or employers of labor or labor organizations voluntarily to adopt will at once give emphasis, clarity, and uniformity to an educational propaganda in that such standards necessarily define the scope of the information disseminated, increase its authority, limit the introduction of irrelevant material, and avoid the advocacy of conflicting measures in various parts of the country.

The history of the educational campaigns of the past—such as, for instance, the crusade against tuberculosis, the undue mortality of infants—and that of the present campaign for the prevention of industrial accidents furnishes us with a number of means by which information in regard to industrial hygiene and the avoidance of occupational complaints may be generally disseminated.

These summarized roughly are:

1. Permanent exhibits.
2. Traveling exhibits, including moving pictures.
3. Popular lectures.
4. Bulletins issued for popular distribution by Federal, State, and local health authorities, and by private associations.
5. Popular articles published by the press.
6. Instruction in public schools.

Permanent exhibits.—The museum of industrial hygiene is a powerful instrument for public education wherever located. Certain museums of industrial hygiene, located abroad, such as the one at Charlottenburg, for example, have aroused much popular interest, necessitating an increase in their funds and enlargement of floor space.

Steps should therefore be undertaken for the establishment of such museums in our important industrial centers. Such a museum is already located in New York City. Such museums should, in size and importance, be on a par with the magnificent museums of natural history common in our large cities, through which an interested throng of visitors is constantly passing. A sufficient number of such museums of industrial hygiene situated throughout the country would undoubtedly play an important part as centers for the dissemination of information in respect to industrial hygiene.

Traveling exhibits.—One need hardly point out the efficiency of the traveling exhibit in that it goes to the people rather than they

to it. As the material of such exhibits is naturally limited to the amount and dimensions required for easy transportation, much of the success of such exhibits depends upon the personality and training of the demonstrators who travel with it and the discrimination with which it is planned.

I know of no other way, however, by which such large numbers of persons may be reached and impressed in so short a time as by means of the traveling exhibit. Moreover, such traveling exhibits possess the further advantage that their subject material may be modified to meet the industrial conditions of the region through which they are traveling. In this way the special information needed in the premises is disseminated. As State health authorities very generally employ this method for educating the public in regard to other health matters, the use of such exhibits for educational purposes in industrial hygiene would be merely the extension of former activities.

Naturally, the moving picture forms a means for reaching an extensive audience which has been largely used in the past for educational purposes. In similar fashion, it constitutes an important and readily available means for popular education in industrial hygiene.

Popular lectures.—Many State and municipal health organizations now possess a staff of lecturers who deliver popular lectures upon health subjects. It can readily be seen that it is practicable to expand existing organizations to provide for the present necessity for popular instruction in industrial hygiene.

Popular articles and bulletins dealing with this subject are here passed over as their sphere and utility have become well defined through previous public health activities in other directions.

Instruction in public schools.—Provisions are made in the public schools of most States for the instruction of school children in hygiene. There is still a tendency on the part of the general public to take such instruction too lightly, or to regard it somewhat in the light of a fad. Yet all who have investigated this subject can not but be impressed with the fact that personal hygiene is the most important factor in maintaining the health and efficiency of the individual, due provision having been made to secure healthful places of employment.

In a recent investigation among the garment workers of New York City, made by the Public Health Service in 1914, neglect of the principles of personal hygiene, rather than insanitary working conditions, was found to play a principal part in the incidence of defects and diseases among these workers. Inasmuch as probably one-third of all school children will subsequently engage in industrial occupations, while the great majority of males in this country are employed, upon reaching manhood, it seems obvious that the proper time to equip the citizen with the hygienic knowledge necessary to enable him to care for his body properly is not after he has entered a given occupation, but is an essential part of the training of the years of growth and development. Real knowledge of personal hygiene is quite as important for the citizen of the future as a knowledge of reading and writing. It would seem, therefore, particularly in connection with the vocational trend observable in the curricula of our most progressive public schools, that the courses of instruction in hygiene ought to be amplified and modified in such manner that the instruction in personal hygiene

will be thoroughgoing and apply especially not only to the present but to the future maintenance of the body in health, after entrance into an occupation.

We must, therefore, consider the public school as an important instrument for improving the hygiene of workers of the future.

Considering immediate measures to be adopted for the education of the present generation of workers, it must be confessed that the outlook is not so hopeful as regards the expectation of results commensurate with the effort expended. No doubt we must await the advent of the succeeding generation for the full fruition of our educational measures. One would hardly expect busy workers of the present, intent upon other things, suddenly to acquire a lively sense of the importance of industrial hygiene and attention to the care of the body. A fortunate countervailing circumstance is the present campaign in the interests of industrial safety which has already prepared the ground, awakened the minds of the present day workers to the value of life and limb and set in motion a complicated machinery for education in the prevention of accidents.

The existing apparatus for the promotion of industrial safety should, in addition to the activities of Federal, State, and municipal health authorities, furnish a useful nucleus for the propagation of education in industrial hygiene and the avoidance of occupational complaints. Besides this we have the various labor organizations which should be enlisted in an educational movement for the improvement of the health of their members.

There remain the employers of labor. The concept is fast gaining ground among them that the individual is one of society's precious assets; that the condition of his health is not a matter of indifference, that it is poor social and business economy to subject workers to avoidable industrial hazards. As a consequence many employers are now beginning voluntarily to improve working conditions in their plants, supervise the health of their personnel, and attempt educational measures among them. The conservation of the health of workers and the improvement of conditions of employment, apart from purely humanitarian aspects, have been found to yield increased efficiency and economy in production, have fostered the spirit of cooperation. The prediction may well be ventured, therefore, that employers will be found in a receptive attitude so far as educational measures are concerned.

What they will ask for, and rightly I believe, is precise information as to the improvements it is desired to effect and the practical means for carrying them out. It is here that the establishment of minimum hygienic standards will be especially valuable, as these constitute excellent guides.

There remains for discussion the agencies by which such an educational campaign may be put into operation. This campaign must be a cooperative enterprise. So far as the Federal Government is concerned, agencies already exist which can contribute their share. For instance, the Public Health Service is empowered by law to study the diseases of man and is conducting investigations in occupational diseases and the relation of occupations to disease. It stands ready to cooperate with State and municipal health authorities in the study of conditions of industrial hygiene in so far as its facilities permit.

In some State and municipal health organizations provision is made for the study and the dissemination of information in regard to industrial hygiene and the prevention of occupational disease.

It needs, therefore, only an extension of agencies already in existence and cooperation in order to call into simultaneous being a number of centers making educational efforts. Boards of education can assist in a material way by improving and revising the methods of teaching hygiene in public schools so that such teaching will have a vocational trend—i. e., that it will fit our embryo citizens for their life's battle, with special reference to their future occupations.

Besides these strictly governmental agencies we have trades organizations and associations of private individuals, such as the National Safety Council, which can exert great educational influence among their members. As an example of such organizations may be cited the Joint Board of Sanitary Control of the Cloak, Suit, and Skirt and Dress and Waist Trades of New York City. This board, organized by mutual consent of the manufacturers and of the unions of these industries, has cognizance of the sanitary conditions in the workshops of the allied industries. Similar organizations in other industries might well wield great educational forces, which, cooperatively directed, should play an important part in the campaign for industrial health.

In conclusion it may be said that the need for an intensive campaign for education in industrial hygiene and the avoidance of occupational complaints is an actuality, and that agencies already exist by which such educational measures may be put into operation. What are mainly required are cooperation and the making of a beginning.



Separatabdruck aus der „Mikrochemie", Nr. 1/6, V. Jahrg. 1927.

Die Mikrochemie und Mikrophysik im Dienste der Gewerbehygiene.

(Neue Wege zur Diagnostik der Bleivergiftung.)

Von P. Schmidt.

Aus dem Hygienischen Institut der Universität Halle a. d. S.

Wer die Geschichte der Diagnostik der Bleivergiftung verfolgt hat, weiß, daß sie nach schwersten Irrungen doch aufwärts geführt hat. Ich selbst erlebte in Leipzig als junger Dozent das Aufatmen der Aerzte, nicht zum wenigsten der Krankenkassen, als die Blutdiagnostik mit Hilfe des einfachen Methylenblau-Blutausstrich-Präparates eingeführt wurde und als man in vielen Fällen fast spezifische Veränderungen der roten Blutkörperchen dem Auge sichtbar, objektiv mikroskopisch nachweisen konnte. J. Schoenfeld hat sich das Verdienst erworben, den Wandel der Dinge an Hand der Ausgaben der Leipziger Ortskrankenkasse dargestellt zu haben: es gibt in Leipzig immer noch die gleiche Zahl Schriftsetzer wie vor zirka 20 Jahren, aber fast keine Bleivergiftungen mehr.

Für manche Fälle sind aber neue Schwierigkeiten entstanden: man stellte fest, daß es sogenannte „gesunde Bleiträger" gibt, d. h. Personen, die Blei in ihren Körper aufgenommen haben und deutliche Blutveränderungen (sogenannte basophile Körnung und Polychromasie der roten Blutkörperchen) zeigen, aber sonst doch völlig oder nahezu völlig gesund und vor allem voll arbeitsfähig sind: Die große Tragweite dieser Tatsache bei Entschädigungsansprüchen nach der neuen deutschen Unfallgesetzgebung (1925), namentlich bei Verdacht auf Hypochondrie und Simulation, leuchtet ein.

Wie oft schon in der Medizin, scheinen uns auch hier wieder Chemie und Physik ein Stück vorwärts bringen zu sollen, und zwar mit Hilfe der Mikroanalyse und Spektrographie. Da wir an den zur Verfügung stehenden Mengen der Untersuchungsstoffe beim Lebenden eine bestimmte Grenze haben (Blut, Liquor cerebrospinalis usw.), kann es sich naturgemäß nur um eine Mikroanalyse handeln. Wir glauben hier im Hygienischen Institut in dieser Hinsicht einen Schritt vorwärts getan zu haben. (A. Necke, M. Klostermann und Verf.)

Von vornherein war ziemlich klar oder wurde schon nach wenigen Vorarbeiten klar, daß nur eine colorimetrische Methode Anwendung finden könne bei der Größenordnung der Bleimenge im

Blute, Liquor cerebrospinalis und im Urin. Es stand das Arnold-Mentzelsche Reagenz[1] auf Superoxyde (Tetramethyldiamidodiphenylmethan) zur Verfügung, das Trillat schon einmal für die Bleibestimmung versucht hatte. Die Trillatsche Vorschrift[2] führte hier aber trotz vieler Mühe nicht zum Ziele: sie gab dauernd die größten Fehlschläge, namentlich stark positive Ausschläge bei blinden Kontrollen. Es gelang endlich nach jahrelanger Arbeit, den Gang der Mikroanalyse so weit zu bessern, daß befriedigende Resultate erzielt wurden.

Nach Zerstörung der organischen Stoffe auf flüssigem Wege ($HNO_3 + H_2SO_4$) erfolgt Fällung aller Schwermetalle durch H_2S unter Druck in ammoniak. Lösung, worauf die Trennung auf dem Asbestfilter mittels Alkohol + H_2SO_4 (Eisen und Mangan) und CyK (Kupfer) vorgenommen wird. Hierauf Lösung des PbS durch HNO_3 und Oxydation durch Natriumhypochlorit im siedenden Wasserbade, Abfiltration des gewonnenen PbO_2 auf Asbest-Glasfilter (Schott) und Lösung mittels Eisessig nach Zusatz des Reagenz. Im Falle des Vorhandenseins von Blei erfolgt Blaufärbung. Betreffs einiger technisch-chemischer Besonderheiten sei auf unsere erste Mitteilung in der „Deutsch. Medizin. Wochenschrift" Nr. 44, 1926, und M. Klostermann: Nachweis kleinster Bleimengen auf chemischem und spektrographischem Wege, „Die Naturwissenschaften", Beilage zur „Klin. Wochenschrift" 1926, Nr. 49, S. 1116, verwiesen. Ganz besonders nachdrücklich sei darauf aufmerksam gemacht, daß folgende Bedingungen zu erfüllen sind:

1. Die optimale Fällungsdauer ist 24 bis 36 Stunden. Zu langes Einleiten von H_2S vergrößert die Dispersität des PbS derart, daß es die Filter passiert.

2. Nach dem Lösen des PbS mit HNO_3 muß mit Na-Azetatlösung nachgewaschen werden, um eventuell gebildetes $PbSO_4$ mit zu erfassen.

3. Vor der Oxydation ist sorgfältigst zu neutralisieren. Die Oxydation geschieht mit Hypochloritüberschuß.

4. Jede Spur von Na ClO ist durch wiederholtes Auswaschen mit kaltem Wasser zu entfernen.

Für jeden, der über colorimetrisch-chemische Methoden orientiert ist, ist klar, daß diese Mikroanalyse nur approximative Werte liefern kann und daß sie womöglich einer qualitativen Er-

[1] Zeitschr. f. angew. Chemie 1902, S. 1093.
[2] Trillat: Compt. rendus 1903; 136, S. 1205.



gänzung bedarf. Eine solche bot sich durch die Spektralanalyse, insbesondere den neuen, von L ö w e konstruierten Spektrographen. Die zu verwertenden Aufnahmen im Ultraviolett versprachen zudem ein wertvolles Dokument für alle juristischen Fälle, die seit der neuen Unfallgesetzgebung für Berufskrankheiten zu erwarten sind.

Diese Hoffnung hat nicht getäuscht. Es ist nach vielen Fehlschlägen gelungen, durch Benutzung von Kohle-Elektroden und Asbest-Einlegefilterchen an der Funkenstrecke (A. Necke) das Bleisuperoxyd auf kleinste Fläche zu infiltrieren, so daß alsdann größtmögliche Konzentration der Bleidämpfe im elektrischen Funken erzielt wird. Mengen von 0,005 mg Pb und darunter sind so noch zu fassen. Ein Spektrogramm (Hüttenarbeiter H.) nebenstehend.

Blei-Emissions-Spektrallinien

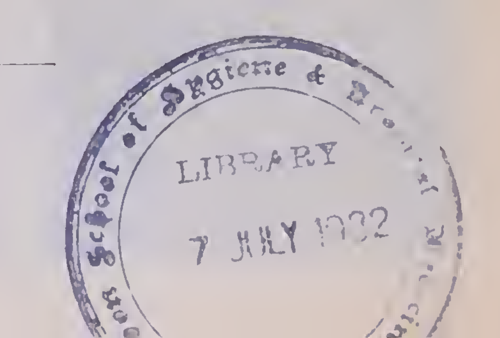
Skalenteil	=	μμ
24.9		249
25.35		253.5
26.7		267
26.8		268
26.95		269.5
27.1		271
27.2		272
32.9		329
33.3		333
33.8		338
35.8		358
38.1		381

Anmerkung: Als Bleilinien sind hier jene Linien im Spektralband der Untersuchungsmaterialien anzusprechen, die sich mit den Indikatorlinien des PbO_2 (hergestellt aus reinstem Bleinitrat) decken, in dem Kontrollstreifen Kohle aber nicht vorhanden sind.

Es braucht kaum gesagt zu werden, daß jetzt schon eine große Zahl Kontrollversuche mit bekannten Pb-Mengen und blinden Versuchen ausgeführt wurden, die bisher durchaus befriedigende Ergebnisse zeitigten.

Unsere Arbeiten sind aber keineswegs als definitiv abgeschlossen zu betrachten, sei es betreffs der Methodik, sei es vor allem betreffs der Frage des Zirkulierens des Bleis im Blutstrome. Nach der herrschenden Auffassung, die auch neuerdings von amerikanischen Forschern (Aub, Fairhall) bekräftigt wurde, war zu erwarten, daß das eigentliche klinische Bild der Vergiftung mit consecutiver Arbeitsunfähigkeit vor allem dann entsteht, wenn das Blei zirkuliert, wenn es z. B. von den wichtigen Knochendepots durch irgend welche Ursachen abgebaut wird (Kalkstoffwechsel). Solche Unterschiede zwischen akuten, subakuten und andererseits latenten Einwirkungen haben wir tatsächlich bei unserem bisherigen Material schon festgestellt. Zu einem abschließenden Urteil reicht die Zahl der bisher untersuchten Fälle allerdings derzeit noch nicht aus. Es wird später nach größeren Untersuchungsreihen zu berichten sein, in welchem Prozentsatz der Krankheitsfälle die neuen Methoden eine Entscheidung herbeiführten.

Abgesehen von einem solch direkten praktischen Nutzen in diagnostischer Beziehung erhoffen wir von dem neuen Verfahren auch manche Aufklärung über das Wesen der Bleivergiftung, insbesondere die Verteilung des Bleis in den Organen und Körperzellen. Nach unseren bisherigen Erfahrungen und namentlich unseren Beobachtungen an den roten Blutelementen scheint das Blei schon in der kleinsten Menge vor allem als Zellkerngift zu wirken.



U. S. TREASURY DEPARTMENT
ANDREW W. MELLON, *Secretary*

PUBLIC HEALTH SERVICE
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PHYSICAL IMPAIRMENTS AND OCCUPATIONAL CLASS

DIFFERENTIAL RATES BASED UPON MEDICAL EXAMINATIONS OF 100,924 NATIVE-BORN, ADULT WHITE INSURED MALES

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PHYSICAL IMPAIRMENTS AND OCCUPATIONAL CLASS[1]

DIFFERENTIAL RATES BASED UPON MEDICAL EXAMINATIONS OF 100,924 NATIVE-BORN, ADULT WHITE INSURED MALES

By Edgar Sydenstricker, *Statistician, United States Public Health Service*, and *Director of Research, Milbank Memorial Fund*, and Rollo H. Britten, *Associate Statistician, United States Public Health Service*

Although the association of economic or social status and health has been given detailed consideration in the past, the studies have related primarily to records of sickness or of death. In fact, so far as known to the writers, no information is available in the literature as to whether a corresponding association would be found in the examinations of the physical condition of persons in various economic or broad occupational groups. In the belief that some light could be thrown upon this important question by the large mass of records of medical examinations of insured persons which has been accumulated by the Life Extension Institute in the past eight years, an analysis of over 100,000 of these records was attempted.

For a description of these records and a discussion of their limitations and value as medicostatistical data the reader is referred to the two preceding papers of this series (1) (2), especially the first paper. It is perhaps sufficient to point out here that the material included in this study was taken from the first (as differentiated from later) medical examinations of 100,924 native white [2] males made for policyholders in more than 40 life-insurance companies by more than 9,000 physicians. These examinations should not be confused with regular insurance medical examinations, made to determine whether a person is eligible for insurance; the records here used were those of health examinations made for policyholders as a part of the welfare service of the insurance companies. It should be pointed out also that the examinations naturally divide themselves into two kinds—those made in the "head" offices (chiefly in New York City and some

[1] Studies in the Diseases of Adult Life No. 4, from the Division of Research, Milbank Memorial Fund. This phase of the studies was carried out in cooperation with the Office of Industrial Hygiene, United States Public Health Service. The data were made available by the medical department of the Life Extension Institute.

[2] It is probable that a small number of foreign born were included, since the examination record in some instances failed to specify that the persons examined were native born.

in Chicago and Boston) and those made elsewhere (in the "field"). Since the former were conducted under more completely supervised conditions, it seemed best, in general, to keep the data for the two separate. Eighty per cent were classified as "field." An average rate was obtained for the combined data by taking the mean of the "head" and "field" rates, so as not to give excessive weight to the "field" data.

CLASSIFICATION INTO BROAD OCCUPATIONAL GROUPS

Differential impairment rates according to social or occupational class for this population of adult males are made possible by reason of the fact that on the health examination record of the Life Extension Institute an entry is made of the "occupation" of the person examined. These entries were not always made with precision or according to any standard occupational classification, but they are sufficiently definite to indicate the broad occupational or social group into which an individual could be classified. In fact, the statistical code used by the Institute contained 128 occupational designations, some of them quite definite and others of necessity somewhat indefinite. For the purpose of this paper a broad classification of these designations was made, as follows: (A) Agricultural; (B) professional; (C) executives, merchants, builders, etc; (D) salesmen; (E) clerks; (F) skilled trade; and (G) miscellaneous.

In some cases the classification of a specific occupation in these broad groups was quite difficult, but it will be seen from Table 1 that the number of persons in such occupations was relatively small. The table gives the classification of the specific occupations (as originally coded) into the broad groups, with the number of persons in each occupation and each group.

TABLE 1.—*Distribution of males according to occupation*

A. Agricultural workers		4,438
B. Professional		14,489
Accountants, auditors	2,703	
Engineers, civil	2,272	
Teachers	2,055	
Lawyers	1,515	
Clergymen, missionaries	1,224	
Dentists	827	
Architects	782	
Druggists	656	
Physicians, trained nurses	404	
Artists	358	
Authors	328	
Chemists	320	
Musicians	315	
Government officials	237	
Undertakers	192	
Optometrists	168	
Others	133	
C. Executives, merchants, builders, etc		15,755
Merchants and jobbers	8,184	
Contractors	2,066	
Manufacturers	1,796	
Brokers, bankers	1,432	
Officers of corporations	1,089	
Jewelers	668	
Hotel, restaurant keepers	430	
Others	90	
D. Salesmen		21,326
Salesmen	9,850	
Managers, plant, store	7,753	
Agents, etc	3,190	
Buyers	533	
E. Clerks		13,642
Bookkeepers, clerks	11,814	
Post office employees	1,358	
Cashiers, tellers	470	

TABLE 1.—*Distribution of males according to occupation*—Continued

F. Trade, skilled	16,714
Machinists	3,409
Carpenters	1,985
Tailors	1,577
Printers	1,256
Electricians	1,235
Plumbers	998
Chauffeurs	836
Barbers	834
Painters	825
Butchers	712
Cutters	507
F. Trade, skilled—Continued	
Woodworkers	462
Metal workers	407
Iron workers	390
Bricklayers	304
Domestic help	283
Blacksmiths	203
Tinsmiths	141
Plasterers	108
Others	235
G. Miscellaneous	14,560
Total	100,924

DIFFERENCES IN THE AGE DISTRIBUTIONS OF THE OCCUPATIONAL CLASSES

Before considering the rates of impairment in the different occupational groups it is desirable to show how far the age distributions of the seven groups are comparable. In the next two tables, therefore, are presented the percentage distribution of the persons considered by age and the actual number in each age group.

TABLE 2.—*Percentage distribution according to age within broad occupational classes of males included in this study*

Age group	A	B	C	D	E	F
	Agricultural workers	Professional	Executives, merchants, builders, etc	Managers (plant store), salesmen, etc	Clerks	Skilled trade
AT HEAD OFFICE						
20–24		8.1	3.0	9.9	19.8	7.1
25–29		20.7	10.4	19.1	23.6	16.7
30–34		22.0	18.0	20.8	18.5	20.6
35–39		19.1	20.8	18.8	13.5	20.1
40–44		11.6	17.3	13.3	10.1	14.1
45–49		8.5	13.0	8.4	6.8	10.6
50–54		5.7	8.5	5.1	3.4	5.6
55–59		2.5	4.8	2.7	2.9	3.1
60–64		.7	2.3	1.3	1.0	1.4
65–69		7	1.3	.6	.4	.5
70+		.4	.5	.1	.1	.3
IN THE FIELD						
20–24	5.7	5.0	3.1	5.1	15.2	6.7
25–29	10.3	15.6	9.3	14.2	22.1	15.0
30–34	17.0	20.8	15.6	19.1	20.1	19.9
35–39	17.9	19.1	19.3	20.0	15.1	22.1
40–44	15.2	14.9	17.1	15.8	11.0	14.9
45–49	12.8	10.2	13.7	11.2	7.2	9.0
50–54	9.0	7.3	9.9	7.3	4.7	5.8
55–59	5.9	3.8	6.3	4.1	2.5	3.2
60–64	3.3	1.8	3.5	2.1	1.4	1.8
65–69	1.9	1.0	1.7	.8	6	8
70+	9	4	.6	4	2	3

TABLE 3.—*Number of males in each age group in broad occupational classes*

Age group	A	B	C	D	E	F
	Agricultural workers	Professional	Executives, merchants, builders, etc.	Managers (plant, store), salesmen, etc.	Clerks	Skilled trade
AT HEAD OFFICE						
20-24	1	164	73	347	387	187
25-29	6	420	249	673	461	437
30-34	9	445	432	732	362	541
35-39	10	387	500	660	263	527
40-44	10	234	416	466	197	370
45-49	13	172	313	297	133	278
50-54	7	116	205	178	67	148
55-59	4	51	116	96	57	80
60-64	6	15	56	44	19	36
65-69	0	14	31	20	7	12
70+	1	8	12	5	2	8
Total	67	2,026	2,403	3,518	1,955	2,624
IN THE FIELD						
20-24	248	621	397	964	1,777	958
25-29	451	1,948	1,188	2,673	2,584	2,153
30-34	746	2,594	1,992	3,584	2,353	2,849
35-39	782	2,380	2,460	3,754	1,768	3,164
40-44	667	1,852	2,187	2,973	1,282	2,142
45-49	562	1,275	1,751	2,096	844	1,377
50-54	392	907	1,262	1,371	547	826
55-59	260	476	800	766	294	456
60-64	144	222	452	394	164	260
65-69	85	124	213	145	65	116
70+	40	55	77	71	21	39
Total	4,377	12,454	12,779	18,791	11,699	14,340

The only striking differences in the age distributions are found in the three business groups (C, D, and E). Of the clerks, about 40 per cent were under 30 years of age, and of the executives only about 13 per cent. On the other hand, about 8 per cent of the clerks were 50 years of age and over, about 13 per cent of the managers and salesmen, and about 20 per cent of the executives. Therefore impairment rates for all ages could not be employed for these three groups without an adjustment for age. The point is of no great consequence, since a study of the impairment curves of the three groups by age showed so few differences that a combination of groups C, D, and E into a single "business" group has been considered feasible for the purpose of this paper. No other differences in the table are great enough to be distinctive in any comparison. It should be noted, however, that the farmer group has a somewhat greater proportion of persons in the older ages, where the prevalence of most impairments is highest.

COMPARISON OF IMPAIRMENT RATES FOR OCCUPATIONAL GROUPS

It is fully realized that no very precise meaning can be attached to a comparison of impairment rates in these various occupational groups for the reason that a clear-cut economic and social differentia-

tion is not possible from the data at hand. However, in the light of the interesting differences found in British mortality data (3) according to social class, even rough differential rates of impairment among broad occupational groups are worth consideration.

The impairment rates in the four occupational groups may be conveniently presented under a series of headings—eyes and ears, teeth, nose and throat, respiratory, heart and pulse, blood vessels, stomach and abdominal, genito-urinary, brain and nervous, miscellaneous, and urinalysis. Under each section will be given a table of rates for each impairment in the group without regard to age (with the omission of a few conditions on account of insufficient numbers), then a table and graph by age for the more important impairments showing apparently significant differences, and finally such discussion of the findings as seems pertinent. The results in all cases are kept distinct for the data obtained at the "head" office and for that obtained in the "field," but in the tables for all ages a column will be included for the total data. This will be, as stated above, the average of the rates of prevalence found at the "head" office and in the "field," except in the case of the agricultural group where, of course, there are rates only for the "field." Owing to small numbers, some combinations of age groups at the beginning and end of life will be necessary.

EYES AND EARS

In addition to corrected and uncorrected defect of vision (less than normal in either eye according to either Snellen or Jaeger tests), the only other item for which numbers justified any comparison by occupational group was diseases of the external eye or eyelid. The prevalence rates for these three items are given in Table 4.

TABLE 4.—*Frequency of certain impairments of the eyes in the four broad occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Defective vision, corrected:					
Agricultural		21.4			938
Professional	34.9	39.2	37.0	707	4,888
Business	26.1	30.7	28.4	2,053	13,301
Skilled trade	18.1	19.5	18.8	475	2,798
Defective vision, uncorrected:					
Agricultural		15.1			659
Professional	28.2	17.3	22.7	571	2,154
Business	32.4	20.3	26.3	2,550	8,762
Skilled trade	39.6	23.8	31.7	1,040	3,408
Diseases of external eye or eyelids:					
Agricultural		.43			19
Professional	1.3	.56	.93	27	70
Business	1.3	.64	.97	101	277
Skilled trade	1.2	.77	.98	31	110

The relatively low rate in the farmer group for diseases of the external eye or eyelid, which are chiefly conjunctivitis and inflamed lids, is of interest. The differences in the case of defective vision are of sufficient importance to justify a comparison by age, which is made in Table 5 and Figure 1.

TABLE 5.—*Age prevalence of defective vision in the four broad occupational groups*

Corrected and uncorrected vision and occupational group	Age												
	In the field								At head office				
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+	20-29	30-34	35-39	40-44	45+
	PER CENT												
Total.													
Agricultural	21.0	18.2	23.9	23.2	23.8	44.7	71.4	78.2	------	------	------	------	------
Professional	40.9	47.7	49.3	53.7	53.8	66.5	79.8	83.4	55.8	57.3	58.6	63.7	85.4
Business	36.4	38.9	42.1	44.1	48.9	64.4	78.7	83.2	47.3	49.1	55.8	62.2	81.7
Skilled trade	29.0	33.5	37.8	34.9	43.1	59.6	73.0	77.6	41.5	47.4	58.4	63.0	81.7
Defective vision, corrected:													
Agricultural	13.7	9.1	12.5	10.4	11.4	24.6	50.0	52.7	------	------	------	------	------
Professional	24.6	30.2	32.6	37.7	36.4	48.2	61.3	63.6	32.0	29.7	35.9	31.2	46.8
Business	19.2	20.6	22.8	24.7	28.8	40.9	55.1	59.8	19.8	21.4	24.2	27.0	39.7
Skilled trade	12.0	12.8	15.3	13.2	17.8	29.0	43.3	47.5	10.4	13.9	18.4	18.9	29.9
Defective vision, uncorrected:													
Agricultural	7.3	9.1	11.4	12.8	12.4	20.1	21.4	25.5	------	------	------	------	------
Professional	16.3	17.5	16.7	16.0	17.4	18.3	18.5	19.8	23.8	27.6	22.7	32.5	38.6
Business	17.2	18.3	19.3	19.4	20.1	23.5	23.6	23.4	27.5	27.7	31.6	35.2	42.0
Skilled trade	17.0	20.7	22.5	21.7	25.3	30.6	29.7	30.1	31.1	33.5	40.0	44.1	51.8
	NUMBER												
Defective vision, corrected:													
Agricultural	34	41	93	81	76	138	196	279	------	------	------	------	------
Professional	153	589	846	898	674	614	556	558	187	132	139	73	176
Business	604	1,327	1,808	1,478	1,853	1,919	1,751	2,070	433	327	344	291	632
Skilled trade	115	276	437	908	382	399	358	414	65	75	97	70	168
Defective vision, uncorrected:													
Agricultural	18	41	85	100	83	113	84	135	------	------	------	------	------
Professional	101	340	434	381	323	233	168	174	139	123	88	76	145
Business	539	1,181	1,533	1,509	1,293	1,103	752	809	602	422	450	380	666
Skilled trade	163	446	640	731	542	422	245	262	194	181	211	163	291

In Figure 1 the curves for all occupations (including the miscellaneous group) are also given, the rates having been published in the second paper in this series (2). The following comments seem justified:

(1) Of most importance is the low rate of defective vision among farmers. In the younger ages, while the other groups have percentages approximating 40, the farmer group shows only 22 or 23. After 50 years of age the differences are not so marked.

(2) No group shows the physiological change (2) around 45 or 50 years of age so clearly as the farmer group, the per cent affected rising from 23 for the age group 40–44 to 71 for the age group 50–54.

(3) In the data for both "head" and "field," the professional group shows the highest percentage of persons with defective vision. The excess, however, is slight after age 40.

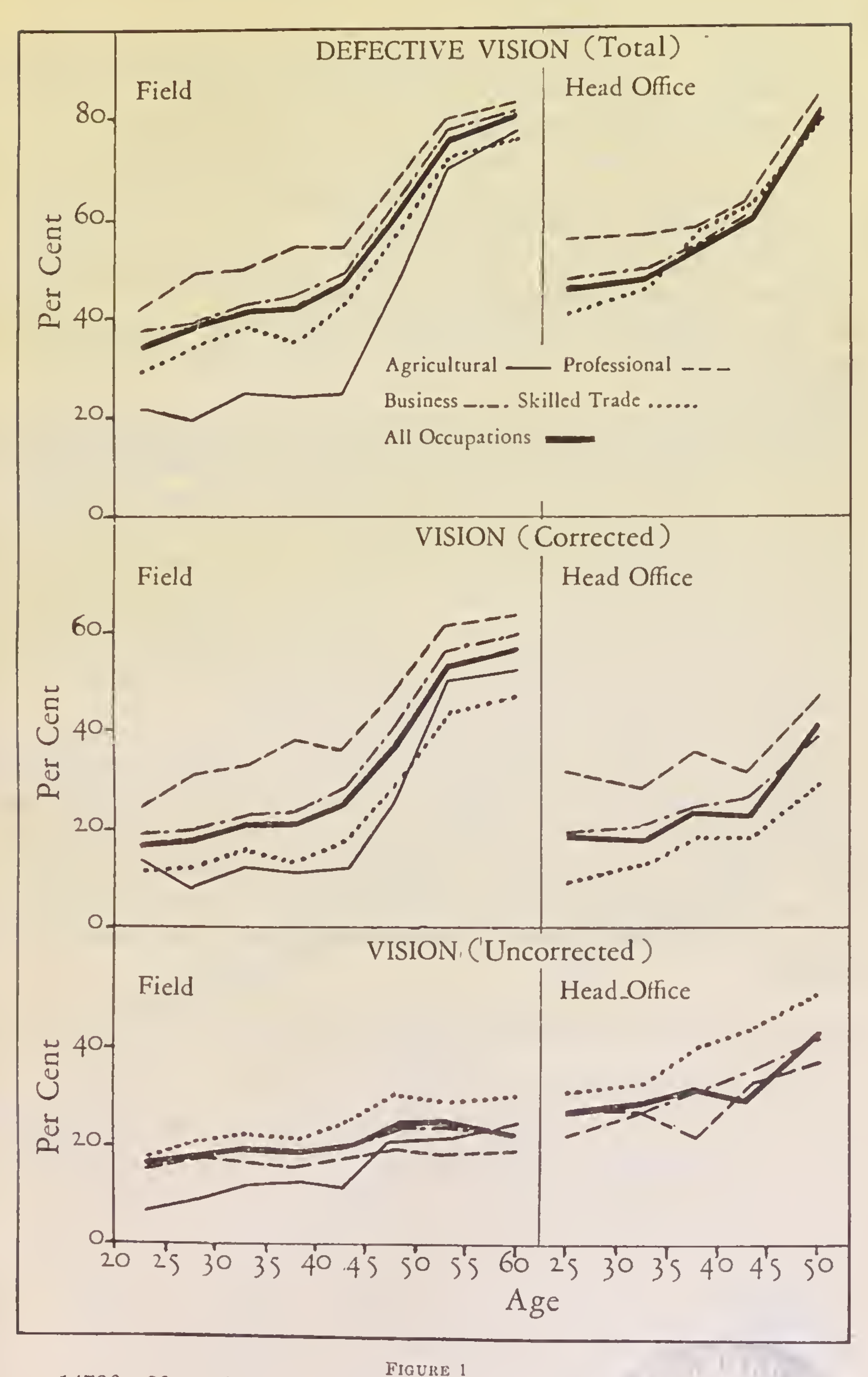


FIGURE 1

14796—30——2

(4) The skilled trade group has a considerably lower than average rate for defective vision in the "field" data, but for the "head" office there is little difference.

(5) When we contrast the percentages for corrected and uncorrected vision, we find chiefly differences which would be expected. The professional group has a high rate for corrected and a low rate for uncorrected vision; the skilled trade has a low rate for corrected and a high rate for uncorrected. The farmer group, however, is low for both corrected and uncorrected vision.

(6) The business group presents a picture which is approximately the average for the entire population considered.

(7) The percentage of persons with uncorrected vision does not increase to any great degree with age. This is true of each occupational group.

(8) The age curve of defective vision in all occupational groups manifests the same general characteristics, i. e., a gradual rise up to 45 years, an abrupt increase during the next 10 years, and then a flattening of the curve, with a tendency to become asymptotic. The asymptotic tendency is suggested only by the "field" data, since the curves for the "head" office could not be carried to the older ages because of small numbers. It should be reiterated that the curves are based purely on the *percentage* with defective vision and do not take into account the *severity* of the defect.

Diseases and defects of the ears have been grouped together, and the rates of prevalence for all ages are given in Table 4. "Defective hearing" was taken as any condition less than 10/10 in either ear.[3] Audiometer tests were not used. Since the rates for defects and diseases of the ear and defective hearing are not mutually exclusive, it is quite probable that part of the defective hearing was due to wax in the ears, for which condition rates are given separately in the table.

TABLE 6.—*Frequency of certain impairments of the ears in the four broad occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Defective hearing:					
Agricultural	----------	12.3	----------	----------	537
Professional	12.8	10.0	11.4	260	1,241
Business	13.8	10.0	11.9	1,084	4,339
Skilled trade	17.8	12.7	15.2	467	1,816
Wax in ears:					
Agricultural	----------	7.1	----------	----------	310
Professional	17.5	9.8	13.6	354	1,218
Business	16.9	9.7	13.3	1,333	4,194
Skilled trade	17.7	10.1	13.9	465	1,449

[3] A description as to how this test was conducted is given in the first paper in this series.

TABLE 6.—*Frequency of certain impairments of the ears in the four broad occupational groups*—Continued

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Perforation of drum:					
Agricultural		.37			16
Professional	1.1	.75	.92	23	94
Business	.94	.64	.79	74	278
Skilled trade	1.5	.66	1.1	39	95
Otitis media or discharging ears:					
Agricultural		.98			43
Professional	.94	.83	.88	19	103
Business	.85	.87	.86	67	378
Skilled trade	.99	1.1	1.0	26	163

Relatively high rates for ear impairments in the skilled trade group are indicated by nearly all the rates in Table 6 as well as relatively

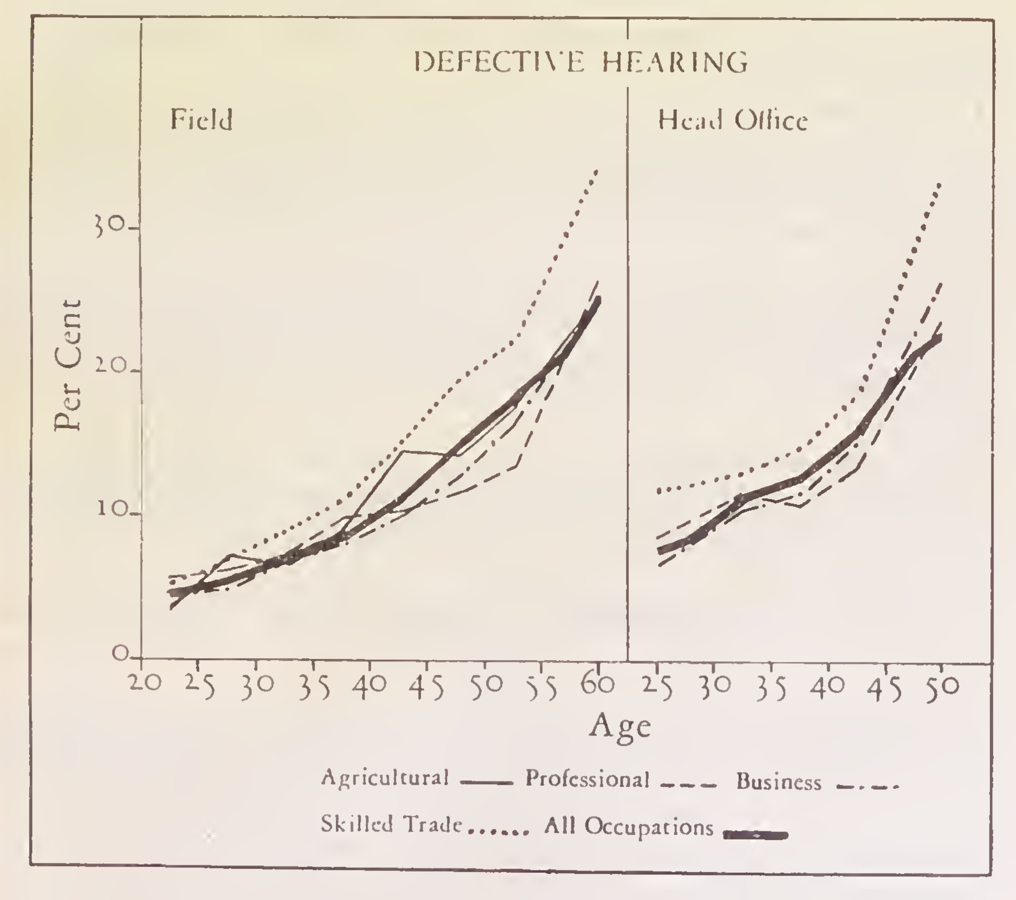


FIGURE 2

low rates for perforation of the drum and wax in ears among farmers. The rates according to age in the various groups are given in Table 7 and Figure 2.

TABLE 7.—*Age prevalence of defective hearing in the four occupational groups*

Occupational group	Age												
	In the field								At head office				
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55+	20–29	30–34	35–39	40–44	45+
	PERCENTAGE												
Agricultural	3.6	6.9	7.0	9.1	14.4	13.9	17.4	25.0	------	------	------	------	------
Professional	5.5	6.1	7.2	9.4	9.9	11.3	13.5	26.0	8.2	11.5	10.9	13.3	23.4
Business	5.0	5.3	7.0	8.2	10.0	12.6	16.7	25.2	7.0	10.7	11.1	15.1	26.9
Skilled trade	5.4	6.7	8.3	10.4	14.7	18.9	21.8	34.3	11.4	12.8	14.2	17.6	33.3
	NUMBER												
Agricultural	9	31	52	71	96	78	68	132	------	------	------	------	------
Professional	34	119	188	223	183	144	122	228	48	51	42	31	88
Business	156	339	552	680	641	590	531	872	154	163	158	163	428
Skilled trade	52	145	236	307	315	260	180	299	71	69	75	65	187

These rates are more suggestive and warrant, we believe, the following comments:

(1) The only occupational group showing a percentage for defective hearing widely different from that for the total data is the skilled trade. Here the difference is clear-cut in both "head" and "field," and suggests the advisability of an analysis by specific occupations in this group.

(2) There is a tendency for the professional group to have slightly lower rates than the average; but when all ear impairments are grouped together, the relatively low rate for the farmer group is not indicated.

(3) It was not deemed necessary to reproduce curves for wax in the ears, but it may be stated that the rate was considerably lower for the farmer group at different ages. No other marked differences were indicated.

(4) The physiological change dependent on age is evidently characteristic of all the groups.

TEETH

The picture shown by rates for defects of teeth (Table 8) is quite different from that showing impairments of eyes and ears in that dental caries and pyorrhea are considerably more prevalent among farmers than in any other "field" group. These conditions, as well as slightly infected gums and insufficient dentistry, are also relatively frequent in the skilled trade group. As would be expected, low rates are found in the professional group.

TABLE 8.—*Frequency of impairments of teeth in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Carious teeth, septic roots:					
Agricultural	----------	18.3	----------	----------	800
Professional	11.6	10.5	11.0	235	1,303
Business	14.6	12.3	13.4	1,147	5,323
Skilled trade	18.9	17.3	18.1	496	2,475
Slightly infected gums:					
Agricultural	----------	10.2	----------	----------	448
Professional	21.7	8.1	14.9	440	1,015
Business	24.5	10.5	17.5	1,936	4,533
Skilled trade	30.6	13.2	21.9	802	1,886
Pyorrhea, definite:					
Agricultural	----------	9.5	----------	----------	414
Professional	4.7	4.0	4.3	95	503
Business	5.3	5.0	5.1	416	2,152
Skilled trade	8.1	7.0	7.5	212	1,005
Missing teeth:					
Agricultural	----------	6.0	----------	----------	264
Professional	5.3	5.7	5.5	108	712
Business	6.9	6.1	6.5	547	2,652
Skilled trade	7.2	7.6	7.4	189	1,091
Presence of heavy dentistry (X ray recommended):					
Agricultural	----------	31.8	----------	----------	1,394
Professional	45.6	35.2	40.4	923	4,381
Business	45.7	34.5	40.1	3,601	14,939
Skilled trade	41.0	30.3	35.6	1,077	4,340

Pyorrhea (definite), carious teeth (septic roots), and slightly infected gums have been selected for comparison by age. The rates are presented in Table 9 and Figure 3.

TABLE 9.—*Age prevalence of certain impairments of the teeth in the four occupational groups*

Condition and occupational group	Age												
	In the field								At head office				
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+	20-29	30-34	35-39	40-44	45+
	PERCENTAGE												
Slightly infected gums:													
Agricultural	5.2	4.0	7.6	8.8	11.7	13.0	17.4	13.6	------	------	------	------	------
Professional	2.9	5.1	6.4	8.9	9.8	10.6	11.5	11.2	19.2	18.9	20.7	29.9	25.0
Business	5.0	7.2	9.4	10.5	11.9	13.3	14.3	14.0	17.3	21.5	27.3	27.4	30.2
Skilled trade	6.3	8.4	12.1	12.4	16.8	18.0	17.4	18.0	20.5	26.4	35.7	36.8	36.9
Carious teeth, septic roots:													
Agricultural	14.1	15.3	16.5	16.0	18.3	19.8	22.7	23.8	------	------	------	------	------
Professional	7.6	8.3	10.8	10.0	11.2	10.9	13.5	12.4	9.6	13.5	12.4	12.8	10.9
Business	9.3	10.2	11.1	12.0	14.0	13.6	14.1	15.8	12.6	12.3	16.8	14.8	17.2
Skilled trade	12.1	14.0	16.5	15.4	19.9	21.6	22.2	22.2	13.1	15.7	18.8	25.4	24.2
Pyorrhea, definite:													
Agricultural	2.0	3.1	5.6	11.0	12.1	12.6	11.7	13.0	------	------	------	------	------
Professional	.8	1.5	2.4	4.5	5.5	6.3	5.5	7.8	1.2	4.0	5.9	6.4	8.5
Business	1.1	2.2	3.6	4.7	6.6	7.1	8.0	8.7	3.2	4.1	5.5	6.8	8.1
Skilled trade	2.0	3.5	5.5	6.7	8.6	11.5	12.5	10.9	5.3	6.3	8.9	8.4	11.9

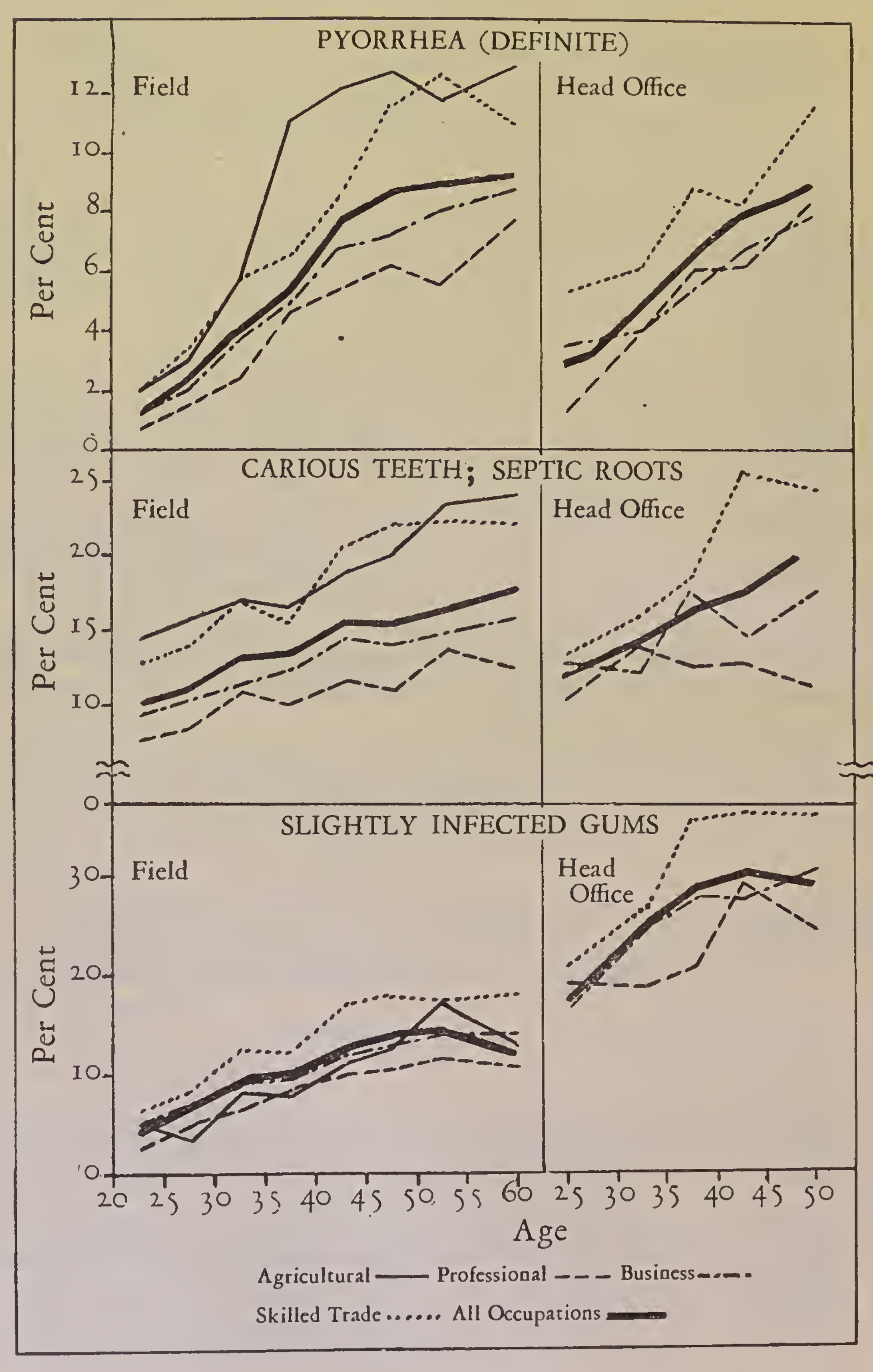

PYORRHEA (DEFINITE)
Field
Head Office
Per Cent
0
2
4
6
8
10
12
CARIOUS TEETH; SEPTIC ROOTS
Field
Head Office
Per Cent
0
10
15
20
25
SLIGHTLY INFECTED GUMS
Field
Head Office
Per Cent
0
10
20
30
20 25 30 35 40 45 50 55 60 25 30 35 40 45 50
Age
Agricultural
Professional
Business
Skilled Trade
All Occupations

FIGURE 3

TABLE 9.—*Age prevalence of certain impairments of the teeth in the four occupational groups*—Continued

Condition and occupational group	Age												
	In the field								At head office				
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	50+	20–29	30–34	35–39	40–44	45+
	NUMBER												
Slightly infected gums:													
Agricultural	13	18	57	69	78	73	68	72	------	------	------	------	------
Professional	18	99	167	212	182	135	101	98	112	84	80	70	94
Business	156	462	748	846	767	622	454	485	378	374	388	296	480
Skilled trade	60	181	345	384	360	248	144	157	128	143	188	136	207
Carious teeth, septic roots:													
Agricultural	35	69	123	125	122	111	89	126	------	------	------	------	------
Professional	47	162	279	237	208	139	122	109	56	60	48	30	41
Business	292	656	881	1,011	804	640	447	546	276	187	239	160	277
Skilled trade	116	301	469	434	427	298	183	193	82	85	99	94	133
Pyorrhea, definite													
Agricultural	5	14	42	86	81	71	46	69	------	------	------	------	------
Professional	5	30	62	103	102	80	50	68	7	18	23	15	32
Business	36	143	283	423	427	334	254	300	69	62	78	73	125
Skilled trade	19	76	158	163	184	159	103	95	33	34	47	31	67

The following comment is offered:

(1) Perhaps the most striking feature is the high rate of these impairments among farmers. The percentage with pyorrhea in this group rises rapidly with age and reaches 11 before the fortieth year, at a time of life when none of the other occupational groups have a higher percentage than 7 and the average is little more than 5. After that there is little increase. Carious teeth (septic roots) also show a high percentage for farmers. Since the rates for slightly infected gums were not above the average in the agricultural group, it is possible that the standard of classification by physicians was somewhat different on the average in the case of this occupational group.

(2) The high rates, in both "head" and "field," for skilled trades are probably to be expected. It will be observed that the curves for this occupational group are consistently high for pyorrhea, carious teeth (septic roots) and slightly infected gums—a definite indication of less care of the teeth in this group probably for economic reasons as well as because of poor hygienic habits.

(3) On the whole, the group with the lowest rates for all teeth conditions is the professional. The business group also has rates which are consistently below the average.

(4) The gradual rise with age is found in all of the occupational groups.

NOSE AND THROAT

The examiner was instructed to record all abnormalities and pathological conditions of the nose and throat, but the statistical codes included only conditions more severe than "slight" except where the word "septic" was used. For instance, in the case of enlarged, buried, or cryptic tonsils only conditions marked ++ or +++

regarded as sufficiently menacing to justify treatment or removal, were coded.

Nasopharyngitis (which included oropharyngitis) was regarded as chronic in coding impairments if there was a postnasal discharge; but the distinction between acute and chronic in this, as in other conditions, can not be taken as of much importance.

Allowing for chance variation, the impression from Table 10 can not be avoided that the most striking fact is the relatively low rates for the farmer group. They are the lowest of the four occupational classes for every condition in the table except nose and throat infection. Minor factors which may contribute to this difference are the slightly higher age distribution among farmers, since nose and throat defects decrease somewhat with age, and the possibility that the examinations of this group, largely rural, may have been somewhat less thorough than those of the other three groups. Although these factors may have some influence, there is still a strong presumption that a real difference exists.

TABLE 10.—*Frequency of certain impairments of the nose and throat in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Enlarged, cryptic, diseased, buried tonsils:					
Agricultural	----------	20.3	----------	----------	888
Professional	62.4	26.5	44.4	1,264	3,303
Business	62.5	27.2	44.8	4,925	11,782
Skilled trade	63.9	27.3	45.6	1,677	3,916
Deflected septum, slight:					
Agricultural	----------	17.5	----------	----------	765
Professional	59.6	24.6	42.1	1,208	3,069
Business	59.1	24.9	42.0	4,651	10,772
Skilled trade	58.8	24.2	41.5	1,543	3,474
Deflected septum, marked:					
Agricultural	----------	2.4	----------	----------	104
Professional	12.0	3.2	7.6	243	397
Business	12.2	4.0	8.1	959	1,741
Skilled trade	12.8	3.9	8.3	337	566
Hypertrophic rhinitis (enlarged turbinates):					
Agricultural	----------	13.9	----------	----------	609
Professional	54.8	20.4	37.6	1,110	2,538
Business	55.3	20.5	37.9	4,353	8,849
Skilled trade	57.2	20.4	38.8	1,501	2,931
Polypi, growths, ulcers:					
Agricultural	----------	.89	----------	----------	39
Professional	1.4	1.3	1.3	28	157
Business	1.2	1.0	1.1	95	445
Skilled trade	2.3	1.2	1.7	60	175
Infection of nasal accessory sinus:					
Agricultural	----------	.30	----------	----------	13
Professional	.94	.22	.58	19	28
Business	.46	.32	.39	36	139
Skilled trade	.57	.19	38	15	27
Frequent colds:					
Agricultural	----------	15.6	----------	----------	682
Professional	16.9	15.1	16.0	342	1,875
Business	16.7	14.8	15.7	1,315	6,392
Skilled trade	18.3	16.6	17.4	481	2,378
Nasopharyngitis, chronic:					
Agricultural	----------	3.8	----------	----------	166
Professional	5.9	5.0	5.4	120	623
Business	6.6	4.6	5.6	520	1,988
Skilled trade	5.6	4.4	5.0	148	631
Nasopharyngitis, acute:					
Agricultural	----------	2.0	----------	----------	89
Professional	2.9	3.9	3.2	48	490
Business	1.8	3.8	2.8	143	1,628
Skilled trade	2.3	4.2	3.2	60	600

Data by age are given for the most important conditions in Table 11 and Figure 4.

TABLE 11.—*Age prevalence of certain conditions of nose and throat in four occupational groups*

Nature of impairment and occupational group	Age												
	In the field								At head office				
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55+	20–29	30–34	35–39	40–44	45+
	Percentage												
Enlarged, cryptic, diseased, buried tonsils:													
Agricultural	29.0	22.4	24.3	21.5	20.8	16.7	15.6	13.6	------	------	------	------	------
Professional	29.5	31.8	29.5	27.7	24.0	22.4	22.8	15.6	62.5	66.3	64.3	60.3	56.9
Business	31.1	32.2	30.6	29.2	25.3	22.7	20.6	18.3	62.6	64.9	65.5	63.2	57.4
Skilled trade	32.9	32.5	32.5	26.4	24.9	23.1	19.1	14.8	63.5	61.6	67.0	65.1	58.4
Hypertrophic rhinitis:													
Agricultural	10.9	14.2	17.8	16.0	11.7	14.1	11.5	11.0	------	------	------	------	------
Professional	23.0	23.6	22.0	22.4	18.7	17.3	17.0	12.9	54.8	53.9	58.7	57.7	50.0
Business	22.3	23.4	21.9	20.7	19.5	18.5	17.8	16.4	55.8	58.8	54.8	58.4	52.5
Skilled trade	24.3	22.7	22.9	19.3	20.8	18.4	16.3	13.2	55.4	62.3	57.7	58.1	53.2
Nasopharyngitis (acute and chronic):													
Agricultural	6.0	5.4	6.7	5.9	5.7	5.5	5.3	5.7	------	------	------	------	------
Professional	8.8	11.5	9.4	8.4	8.0	8.5	7.7	7.2	8.9	7.2	9.6	9.4	6.6
Business	8.9	9.5	9.0	8.8	8.0	7.4	7.1	6.5	8.5	9.3	8.6	8.7	7.2
Skilled trade	9.0	8.7	7.3	8.2	9.1	9.3	6.8	6.3	8.0	7.6	9.9	7.9	6.4
	Number												
Enlarged, cryptic, diseased, buried tonsils:													
Agricultural	72	101	181	168	139	94	61	72	------	------	------	------	------
Professional	183	620	766	659	445	286	207	137	365	295	249	141	214
Business	975	2,076	2,423	2,067	1,627	1,064	656	633	1,370	990	932	682	910
Skilled trade	315	699	927	1,097	534	318	158	129	396	365	343	245	328
Hypertrophic rhinitis:													
Agricultural	27	64	133	125	78	79	45	58	------	------	------	------	------
Professional	143	459	570	533	346	220	154	113	320	240	227	135	188
Business	700	1,505	1,739	1,483	1,253	870	565	567	1,221	898	780	584	831
Skilled trade	233	488	651	777	445	254	135	115	346	337	304	215	299
Nasopharyngitis (acute and chronic):													
Agricultural	15	24	50	46	38	31	21	30	------	------	------	------	------
Professional	55	225	243	201	148	109	69	63	52	32	37	22	25
Business	280	610	713	622	515	349	226	224	186	142	122	94	108
Skilled trade	86	188	266	334	195	128	56	55	50	41	52	29	36

The following observations may be made:

(1) A definitely lower rate of enlarged, diseased, buried, or cryptic tonsils, hypertrophic rhinitis, and nasopharyngitis was found among farmers than among other occupational groups.

(2) The percentages of persons found to have these conditions were remarkably similar in the other three occupational groups.

(3) The gradual decline in prevalence as age advances is consistently found in all four occupational groups and for all of the nose and throat conditions appearing in the diagram.

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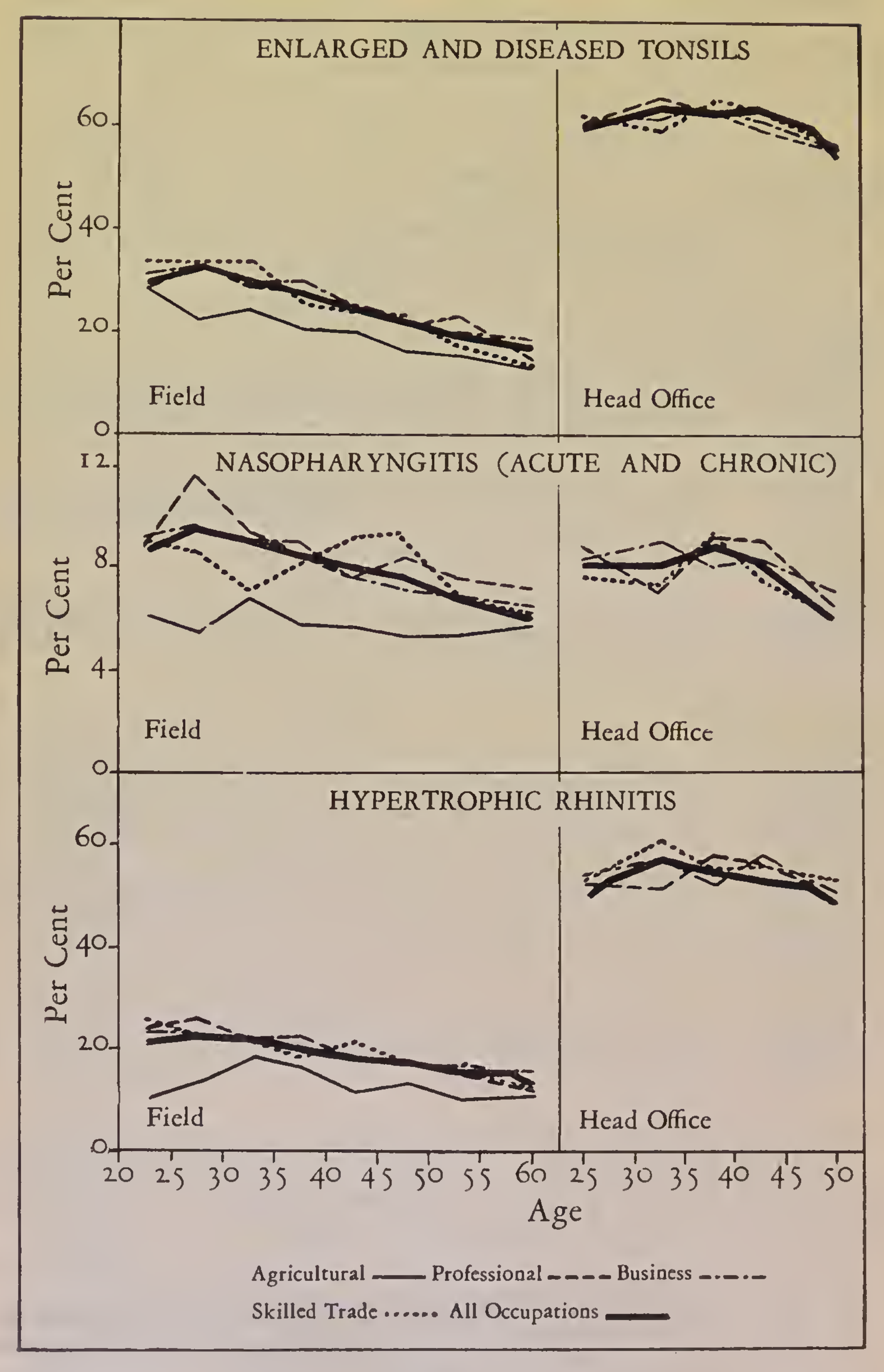

ENLARGED AND DISEASED TONSILS
Per Cent
60
40
20
0
Field
Head Office
NASOPHARYNGITIS (ACUTE AND CHRONIC)
Per Cent
12
8
4
0
Field
Head Office
HYPERTROPHIC RHINITIS
Per Cent
60
40
20
0
Field
Head Office
20 25 30 35 40 45 50 55 60 25 30 35 40 45 50
Age
Agricultural
Professional
Business
Skilled Trade
All Occupations

FIGURE 4

RESPIRATORY

For the group of respiratory conditions, the prevalence rates for chronic conditions found on physical examinations were too low to justify any consideration at different ages. Table 12 gives the rates for all ages. It is difficult to draw any conclusions from this table as to any significant differences, but the data are communicated for what they are worth. The occurrence of slightly higher rates for all conditions, except asthma, in the skilled trade group is possibly suggestive and is not inconsistent with other data.

TABLE 12.—*Frequency of certain respiratory impairments in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Abnormal signs in lungs, not suggestive of tuberculosis:					
Agricultural	----------	2.9	----------	----------	129
Professional	4.1	4.0	4.0	83	492
Business	5.7	3.9	4.8	452	1,674
Skilled trade	5.9	4.5	5.2	154	640
Tuberculosis (including suspects):					
Agricultural	----------	1.1	----------	----------	50
Professional	1.6	1.0	1.3	31	125
Business	1.4	1.1	1.3	112	475
Skilled trade	1.8	1.3	1.5	47	184
Emphysema:					
Agricultural	----------	.46	----------	----------	20
Professional	.89	.44	.66	18	55
Business	.91	.38	.64	72	166
Skilled trade	1.3	.42	.86	33	60
Asthma:					
Agricultural	----------	.69	----------	----------	30
Professional	.30	.49	.39	6	61
Business	.33	.32	.32	26	138
Skilled trade	.30	.40	.35	8	58

HEART AND PULSE

As was pointed out in our earlier papers, physical impairments were recorded by the examiner without giving a definite diagnosis. Thus a diagnosis of heart conditions, such as mitral regurgitation, is not recorded on the examination form. Instead, information is given as to the location and character of the murmur. A diagnosis for statistical purposes only was arrived at by the staff of the medical department in the Life Extension Institute in coding the records, definite instructions having been formulated as to the interpretation of the murmurs recorded. Table 13 gives the rates of prevalence, all ages, for the various heart and pulse conditions so recorded and interpreted.

TABLE 13.—*Frequency of impairments of heart and pulse in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Rapid pulse, over 90:					
Agricultural	----------	2.7	----------	----------	119
Professional	11.9	5.5	8.7	242	685
Business	11.3	6.0	8.6	890	2,578
Skilled trade	12.0	5.4	8.7	314	776
Slow pulse, below 58:					
Agricultural	----------	2.1	----------	----------	91
Professional	.44	1.1	.77	9	135
Business	.66	.84	.75	52	365
Skilled trade	.57	.70	.63	15	100
Intermittent pulse, extra systoles:					
Agricultural	----------	.57	----------	----------	25
Professional	.79	.53	.66	16	66
Business	.76	.64	.70	60	277
Skilled trade	.57	.51	.54	15	73
Functional murmur or irregularity:					
Agricultural	----------	4.0	----------	----------	173
Professional	7.6	5.4	6.5	153	669
Business	7.0	5.0	6.0	551	2,171
Skilled trade	7.3	4.9	6.1	191	705
Enlargement:					
Agricultural	----------	2.9	----------	----------	129
Professional	1.6	2.5	2.0	33	312
Business	2.2	2.3	2.2	175	1,011
Skilled trade	2.7	2.7	2.7	72	387
Valvular lesions:					
Agricultural	----------	2.1	----------	----------	95
Professional	2.4	2.5	2.5	48	320
Business	3.0	2.8	2.8	236	1,215
Skilled trade	2.9	3.0	3.0	78	429
Myocardial changes:					
Agricultural	----------	.23	----------	----------	10
Professional	.44	.26	.35	9	33
Business	.58	.28	.43	46	123
Skilled trade	.84	.28	.56	22	40

Although a remarkable uniformity appears in the rates for the various broad occupational groups, it may be noted that the farmer group has lower rates for valvular diseases and functional murmurs than any other occupational class. It is also indicated that the farmer group has the highest percentage with pulse rates below 58 and the lowest percentage with pulse rates of 90 and more. Without further information any comment on the reasons for such marked differences is purely speculative. The rates for valvular lesions and enlarged heart according to age are given in Table 14 and Figure 5.

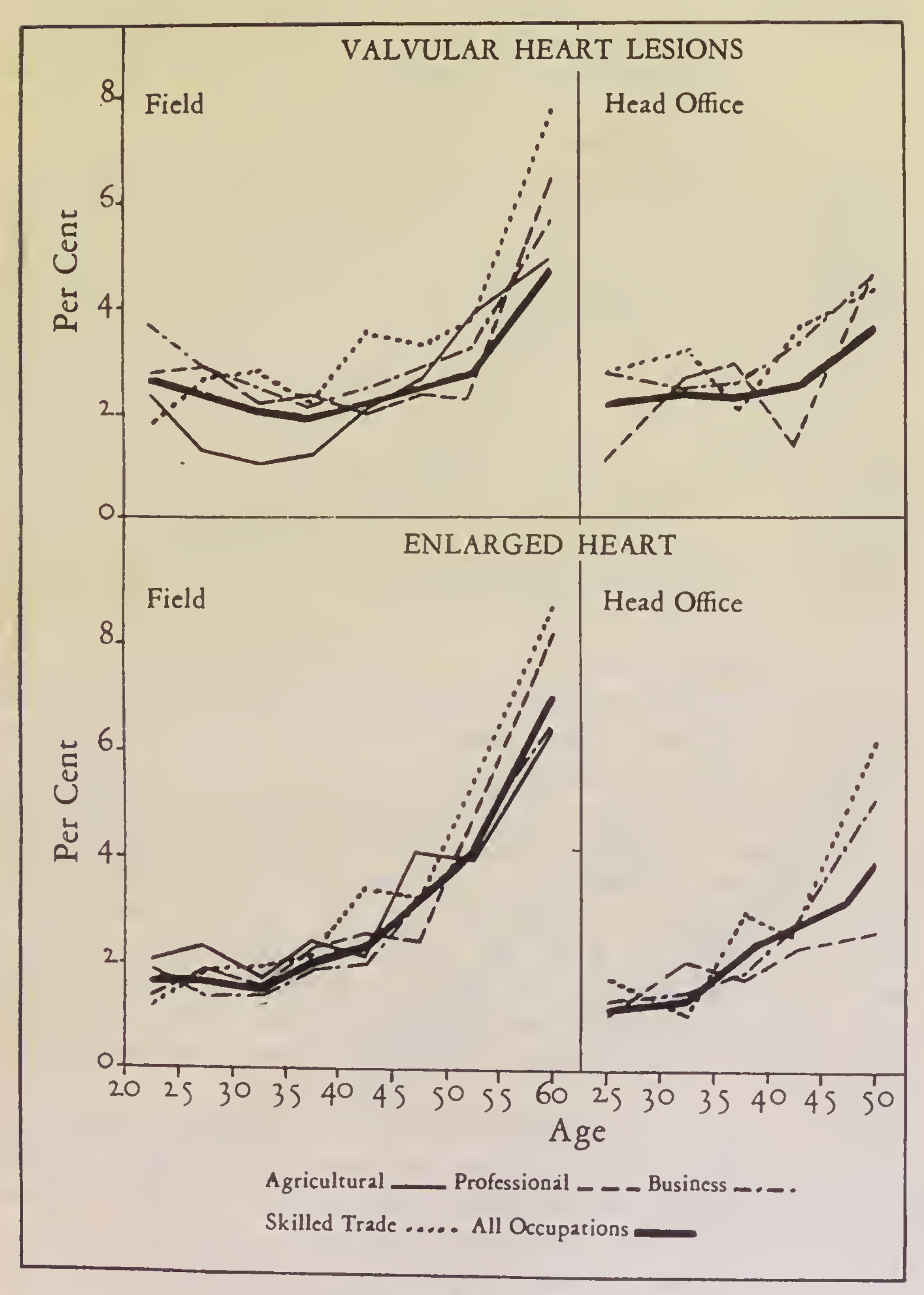

VALVULAR HEART LESIONS
Field
Head Office
ENLARGED HEART
Field
Head Office
Per Cent
Per Cent
0
2
4
6
8
20 25 30 35 40 45 50 55 60 25 30 35 40 45 50
Age
Agricultural
Professional
Business
Skilled Trade
All Occupations

FIGURE 5

TABLE 14.—*Age prevalence of valvular lesions and enlarged heart in the four occupational groups*

Nature of impairment and occupational group	Age												
	In the field								At head office				
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+	20-29	30-34	35-39	40-44	45+
	PERCENTAGE												
Enlarged heart.													
Agricultural	2.0	2.2	1.6	2.3	2.1	3.9	3.8	6.2	------	------	------	------	------
Professional	1.3	1.7	1.5	2.2	2.3	2.3	4.4	7.8	0.9	1.8	1.6	2.1	2.4
Business	1.8	1.4	1.4	1.8	1.9	3.0	3.9	6.3	1.1	1.3	1.6	2.4	4.9
Skilled trade	1.2	1.7	1.7	2.0	3.3	3.1	5.2	8.4	1.6	.9	2.7	2.4	6.0
Valvular lesions:													
Agricultural	2.4	1.3	1.0	1.1	1.9	2.5	3.6	4.9	------	------	------	------	------
Professional	2.7	2.8	2.2	2.2	2.1	2.3	2.2	6.2	1.0	2.4	2.8	1.3	4.5
Business	3.8	2.8	2.5	2.1	2.3	2.7	3.1	5.5	2.6	2.3	2.5	3.1	4.5
Skilled trade	1.8	2.6	2.6	2.1	3.4	3.2	3.5	7.7	2.6	3.1	1.9	3.3	1.3
	NUMBER												
Enlarged heart:													
Agricultural	5	10	12	18	14	22	15	33	------	------	------	------	------
Professional	8	33	38	53	43	29	40	68	5	8	6	5	9
Business	56	93	114	138	121	141	124	218	24	20	23	26	78
Skilled trade	11	36	48	69	70	43	43	73	10	5	14	9	34
Valvular lesions:													
Agricultural	6	6	8	10	13	14	14	27	------	------	------	------	------
Professional	17	57	62	55	39	29	22	56	8	14	12	4	17
Business	123	187	202	174	151	127	98	182	62	38	41	34	79
Skilled trade	17	61	80	75	75	47	29	69	18	17	10	13	26

It may be noted that—

(1) Perhaps the most striking general fact brought out in the curves for heart conditions is the remarkable uniformity of the picture, regardless of the occupational group.

(2) Although one can not with assurance conclude that any occupational group has higher or lower rates for heart and pulse conditions, an interesting difference is indicated for the farmer group with respect to the character of the age curve for valvular heart lesions. During the early part of life the rate is relatively low, but later it rises to about the same level as that for other occupational groups. Does this suggest that the rates in the agricultural group more nearly represent the prevalence to be expected as a normal part of the aging process?

(3) In the case of valvular heart lesions, the decrease during the early part of life, as noted in the second paper of this series, is manifestly a characteristic of the group as a whole. In the "field" records the skilled labor group alone fails to show this tendency.[4]

(4) Enlarged heart appears to be found in about the same percentage of persons in all the occupational groups.

(5) The changes in prevalence at different ages of heart and pulse conditions, as shown for the entire population considered (2), is typical of all the broad occupational groups.

[4] In the "head" office, the age groups 20–24 and 25–29 were necessarily put together, naturally obliterating this tendency.

ARTERIAL THICKENING

Some interesting indications appear with respect to arterial thickening, but they may be considered more advantageously from the

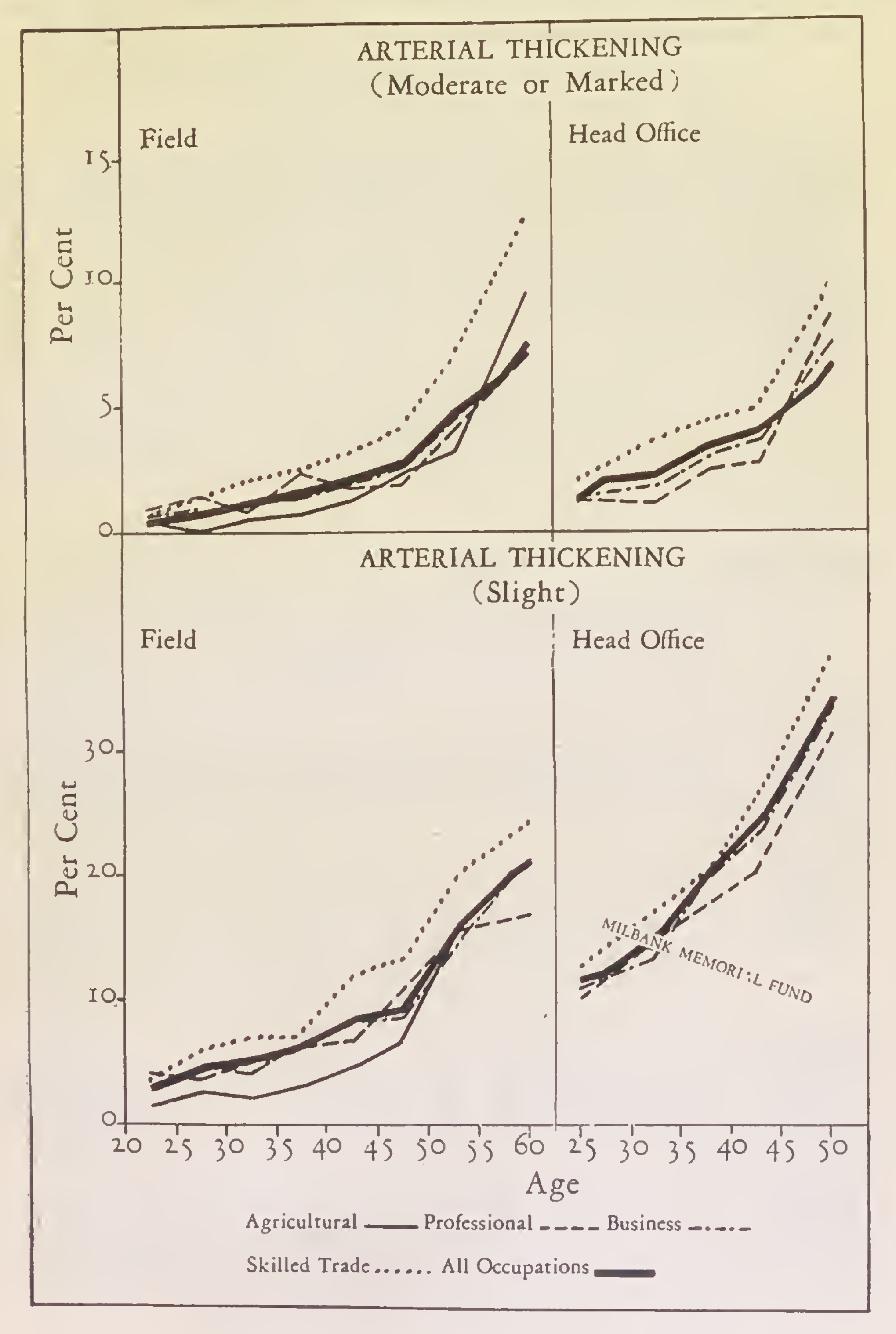


FIGURE 6

point of view of changes in age. Table 15 gives the rates for all ages, and Table 16 and Figure 6 give the data by age.

TABLE 15.—*Frequency of impairments of arterial thickening in the four occupational groups*

Nature of impairment and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Arterial thickening, slight:					
Agricultural	----------	6.5	----------	----------	280
Professional	17.0	7.6	12.3	344	949
Business	19.2	7.9	13.5	1,512	5,397
Skilled trade	21.3	9.4	15.3	560	1,346
Arterial thickening, moderate:					
Agricultural	----------	1.8	----------	----------	78
Professional	2.9	1.9	2.4	59	237
Business	3.0	1.9	2.4	240	839
Skilled trade	4.6	2.7	3.6	122	382
Arterial thickening, marked:					
Agricultural	----------	.39	----------	----------	17
Professional	.15	14	.14	3	17
Business	.23	21	.22	18	91
Skilled trade	.15	.37	.26	4	53

TABLE 16.—*Age prevalence of arterial thickening in the four occupational groups*

Nature of impairment and occupational group	Age												
	In the field								At head office				
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55+	20–29	30–34	35–39	40–44	45+
	PERCENTAGE												
Arterial thickening, slight:													
Agricultural	1.6	2.4	2.0	3.1	4.5	6.4	14.8	20.4	------	------	------	------	------
Professional	4.4	3.9	5.2	6.3	6.9	10.5	15.0	16.7	9.4	13.9	17.1	19.7	30.6
Business	3.7	4.7	4.8	6.6	7.9	8.8	14.0	20.3	10.5	13.2	18.8	23.5	33.5
Skilled trade	3.7	5.7	6.7	6.9	11.5	12.5	18.5	24.0	11.9	16.3	19.2	25.4	36.1
Arterial thickening, moderate or marked:													
Agricultural	.4	------	.6	.7	1.2	2.0	2.9	10.0	------	------	------	------	------
Professional	.8	1.2	.8	2.1	1.7	1.8	3.6	7.4	1.2	1.1	2.3	2.6	9.3
Business	.5	1.0	1.2	1.4	1.9	2.7	4.2	7.6	1.3	1.6	2.7	3.2	7.8
Skilled trade	.6	1.2	1.8	2.0	3.0	4.2	6.9	12.6	1.8	3.3	4.0	4.6	10.5
	NUMBER												
Arterial thickening, slight:													
Agricultural	4	11	15	24	30	36	58	108	------	------	------	------	------
Professional	27	75	134	149	127	134	136	167	55	62	66	46	115
Business	116	304	380	489	508	414	445	703	230	202	268	254	533
Skilled trade	35	123	190	255	247	172	153	209	74	88	101	94	203
Arterial thickening, moderate or marked:													
Agricultural	1	------	5	6	8	11	11	53	------	------	------	------	------
Professional	5	24	22	51	31	23	33	65	7	5	9	6	35
Business	17	63	94	112	123	127	134	264	29	24	38	35	128
Skilled trade	6	27	51	57	65	58	57	110	11	18	21	17	59

The following comments seem pertinent:

(1) A definitely higher rate is to be noted for the skilled trade group, in both "head" office and "field" data and for both moderate and slight arterial thickening, than for the other three occupational classes.

(2) Farmers, also a group performing hard physical work, on the other hand, seem to have a low rate during the earlier part of adult life; but by 50 years the curve blends with the average.

(3) More important than the differences, perhaps, is the fact that this degenerative change occurs in about the same proportion of persons in the different walks of life shown.

STOMACH AND ABDOMINAL ORGANS

A large group of conditions have been considered together in Table 17.

Table 17.—*Frequency of stomach and abdominal impairments in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Weak inguinal rings					
Agricultural		2.1			94
Professional	10.8	3.9	7.3	218	489
Business	11.0	4.3	7.6	869	1,851
Skilled trade	10.9	4.8	7.8	287	690
Inguinal hernia, no truss:					
Agricultural		2.7			120
Professional	2.6	1.6	2.1	52	195
Business	3.4	1.9	2.6	268	838
Skilled trade	3.2	2.4	2.8	84	338
Inguinal hernia, truss:					
Agricultural		3.5			153
Professional	2.0	2.3	2.1	40	281
Business	2.6	2.4	2.5	205	1,048
Skilled trade	2.7	2.7	2.7	71	386
Other hernias:					
Agricultural		.66			29
Professional	.44	.65	.54	9	81
Business	.74	.79	.76	58	342
Skilled trade	.76	.87	.81	20	125
Tenderness in region of appendix:					
Agricultural		4.1			178
Professional	2.9	2.8	2.8	59	354
Business	2.0	3.0	2.5	158	1,301
Skilled trade	2.5	3.1	2.8	66	451
Constipation:					
Agricultural		27.2			1,190
Professional	33.0	32.9	32.9	668	4,092
Business	33.0	32.9	32.9	2,596	14,217
Skilled trade	37.7	34.5	36.1	988	4,945
Acid stomach:					
Agricultural		11.7			513
Professional	10.0	11.1	10.5	203	1,379
Business	10.4	10.4	10.4	817	4,509
Skilled trade	10.3	10.6	10.4	271	1,517
Gastric disturbances:					
Agricultural		8.9			388
Professional	8.5	8.0	8.2	173	1,000
Business	8.2	7.8	8.0	645	3,371
Skilled trade	9.3	7.7	8.5	243	1,100

The suggestive indications are (1) the relatively low rate of constipation in the agricultural group as contrasted with a relatively high rate in skilled trades; (2) the relatively frequent prevalence of tenderness in the region of the appendix in the agricultural group; (3) the relatively low prevalence of weak inguinal rings in the same group. Graphs by age have been prepared for constipation and hernia because of their great frequency. The data relating to tenderness over appendix hardly justify graphic presentation, but it may be stated that the agricultural group has a consistently high rate for this condition when comparison is made by age, especially for the first. Similarly, comparison by age showed that weak inguinal rings were found in a smaller percentage of farmers at nearly every age.

Table 18 and Figure 7 present the data for constipation and hernia.

TABLE 18.—*Age prevalence of constipation and hernia in the four occupational groups*

Nature of impairment and occupational group	Age												
	In the field								At head office				
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55+	20–29	30–34	35–39	40–44	45+
	PERCENTAGE												
Hernia:													
Agricultural	1.2	3.1	4.0	6.2	5.4	8.4	8.6	17.0	------	------	------	------	------
Professional	1.7	2.1	3.5	3.9	3.9	6.3	8.4	11.7	1.4	3.4	4.9	7.6	10.9
Business	1.6	2.3	2.8	4.0	6.0	7.5	8.8	13.3	2.6	4.8	6.1	8.5	15.4
Skilled trade	2.1	3.2	4.3	4.5	6.1	8.5	11.2	17.8	2.6	4.3	6.7	5.7	16.0
Constipation:													
Agricultural	19.0	20.6	25.6	27.2	28.2	29.2	31.1	32.5	------	------	------	------	------
Professional	28.8	30.3	32.6	32.5	35.0	35.9	34.4	32.5	30.7	31.5	36.7	34.2	33.8
Business	28.7	31.5	33.2	33.1	34.0	33.5	33.9	33.6	31.1	32.6	31.8	35.6	34.8
Skilled trade	28.5	36.4	33.5	32.5	38.0	36.2	33.4	36.7	29.3	44.0	38.7	40.8	37.7
	NUMBER												
Hernia:													
Agricultural	3	14	30	48	36	47	34	90	------	------	------	------	------
Professional	11	42	90	92	72	81	66	103	8	15	19	18	41
Business	50	151	222	319	388	354	281	461	57	73	87	92	214
Skilled trade	20	68	124	145	130	117	92	155	16	23	35	21	83
Constipation:													
Agricultural	47	93	191	213	188	164	122	172	------	------	------	------	------
Professional	179	591	845	774	648	458	312	285	179	140	142	80	127
Business	901	2,029	2,635	2,393	2,193	1,571	1,078	1,164	682	497	452	384	553
Skilled trade	273	783	954	1,280	814	498	276	320	183	238	204	151	212

The low rate of constipation among farmers, especially in the younger ages, perhaps may be ascribed to their active life, but this reason does not seem to account for the slightly higher than average rate in the skilled trade group. Whether diet or occupational conditions or other reasons are involved, it is of course impossible to say from the data at hand unless definite hazards characteristic of specific occupations are taken into account in a more detailed occupational analysis.

In regard to hernia, some rather interesting indications may be summarized, as follows:

(1) Greater differences in the rates for hernia than for other impairments in the intestinal region might have been anticipated in

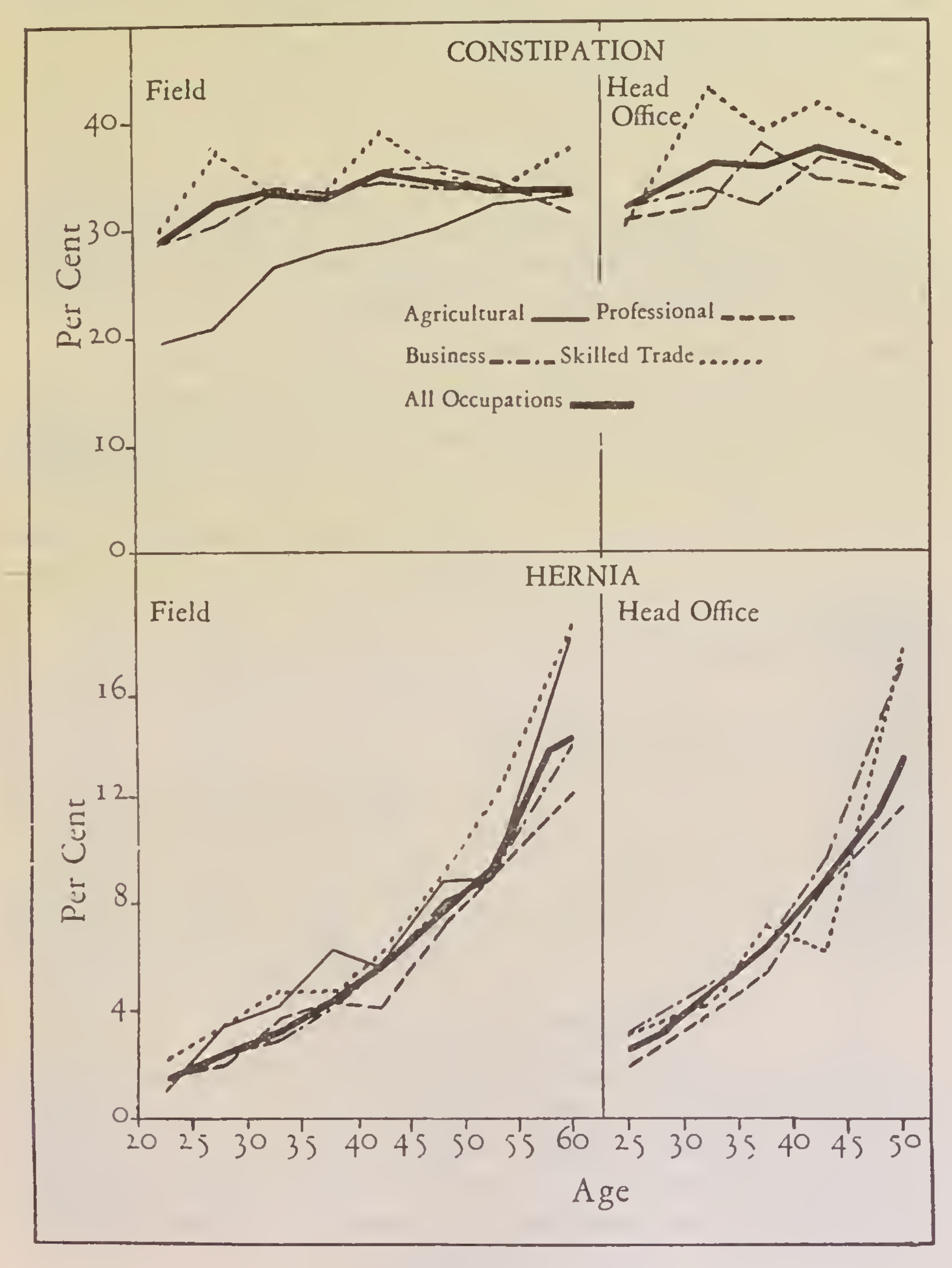


FIGURE 7

view of the fact that the farmer and the skilled trade groups include persons engaged in heavy labor. While these two groups do seem to have the highest rates, the differences are quite slight.

(2) The professional group has the lowest rates; but again the difference is of no great significance.

Thus, for hernia, the resemblances in the curves for different occupational groups are more striking than the differences. How far the population was a selected one can not be ascertained, of course, without knowing the age at which the individuals were insured and to what extent hernia caused exclusion from insurance. At any rate, it is suggested quite definitely by these curves that the increase in the hernia rate with age is associated with the physiological weakening which accompanies the aging process.

VARICOSE VEINS, VARICOCELE, HYDROCELE, HEMORRHOIDS

The prevalence rates for all ages are given in Table 19 for varicose veins, varicocele, hydrocele, and hemorrhoids. No clear differences in the four occupational groups are suggested.

TABLE 19.—*Frequency of varicose veins, etc., in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Varicose veins:					
Agricultural		4.1			181
Professional	5.1	3.4	4.2	104	421
Business	6.8	3.9	5.3	534	1,685
Skilled trade	7.4	4.5	5.9	193	641
Varicocele:					
Agricultural		6.0			262
Professional	9.7	8.9	9.3	197	1,105
Business	9.9	8.1	9.0	783	3,510
Skilled trade	9.6	8.3	8.9	252	1,193
Hydrocele:					
Agricultural		.69			30
Professional	.79	.53	.66	16	66
Business	.58	.54	.56	46	234
Skilled trade	.72	.50	.61	19	72
Hemorrhoids:					
Agricultural		10.9			478
Professional	15.0	12.5	13.7	303	1,554
Business	13.4	12.3	12.8	1,056	5,301
Skilled trade	11.9	11.2	11.5	313	1,608

GENITOURINARY IMPAIRMENTS

The only feature of interest in Table 20, giving the rates for enlarged prostate and frequent or painful urination, is the high rate for the latter in the agricultural group. Since 616 cases were recorded, this could hardly be regarded as a matter of chance, and the rate is consistently high for each age group. Obviously no definite statement can be made as to the cause of the difference.

TABLE 20.—*Frequency of genitourinary impairments in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Prostate enlarged, tender:					
Agricultural		6.6			289
Professional	8.8	5.3	7.0	178	656
Business	9.8	5.5	7.6	773	2,378
Skilled trade	8.6	4.6	6.6	226	659
Frequent or painful urination (nocturia):					
Agricultural		14.1			616
Professional	8.1	8.4	8.2	165	1,046
Business	7.9	8.5	8.2	619	3,659
Skilled trade	8.8	8.3	8.5	232	1,188

BRAIN AND NERVOUS SYSTEM

Rates for defects of the brain and nervous system are given in Table 21. There are no differences of great importance among the rates of the four groups.

TABLE 21.—*Frequency of brain and nervous impairments in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Sluggish, absent, unequal, or irregular reflexes:					
Agricultural		3.5			153
Professional	3.9	2.8	3.4	79	351
Business	4.2	3.1	3.6	332	1,327
Skilled trade	4.5	3.5	4.0	118	496
Exaggerated reflexes:					
Agricultural		1.8			80
Professional	4.2	2.7	3.4	85	338
Business	3.9	2.2	3.0	305	970
Skilled trade	4.2	2.2	3.2	109	315
Nervousness with increased reflexes:					
Agricultural		.57			25
Professional	1.8	1.1	1.4	37	136
Business	1.8	.84	1.3	139	365
Skilled trade	1.4	.61	1.0	38	88
Romberg, positive:					
Agricultural		.30			13
Professional	.54	.26	.40	11	33
Business	.53	.37	.45	42	158
Skilled trade	.80	.43	.61	21	61
Nervousness:					
Agricultural		4.5			199
Professional	8.4	7.6	8.0	170	943
Business	7.1	6.9	7.0	559	2,970
Skilled trade	7.6	6.5	7.0	199	929

MISCELLANEOUS IMPAIRMENTS

A group of impairments and histories of certain symptoms are given in Table 22. Although some points are of interest, such as the high rate for frequency of backache in the farmer and skilled trade groups, yet no items seemed to be of sufficient importance to warrant a consideration by age.

TABLE 22.—*Frequency of miscellaneous impairments in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Chronic skin affections:					
Agricultural	----------	5.9	----------	----------	258
Professional	11.2	10.3	10.7	227	1,284
Business	10.6	9.6	10.1	834	4,169
Skilled trade	9.6	9.2	9.4	251	1,317
Adenitis (2 or more lymphatic nodes):					
Agricultural	----------	1.9	----------	----------	81
Professional	2.4	2.8	2.6	49	350
Business	5.7	2.8	4.2	448	1,195
Skilled trade	3.1	4.0	3.6	82	567
Neuralgia, neuritis:					
Agricultural	----------	1.2	----------	----------	54
Professional	.89	1.1	.99	18	133
Business	.63	.86	.74	50	371
Skilled trade	.57	.86	71	15	124
Mastoids:					
Agricultural	----------	.30	----------	----------	13
Professional	.49	.42	.46	10	52
Business	.44	.34	39	35	149
Skilled trade	.23	.20	.21	6	28
Insomnia:					
Agricultural	----------	1.1	----------	----------	48
Professional	1.0	1.1	1.0	21	143
Business	1.7	1.0	1.3	132	434
Skilled trade	2.4	1.4	1.9	62	197
Enlarged thyroid, simple goiter:					
Agricultural	----------	1.8	----------	----------	80
Professional	.99	2.5	1.7	20	308
Business	.91	2.3	1.6	72	1,016
Skilled trade	.61	2.4	1.5	16	342
Dizziness:					
Agricultural	----------	9.1	----------	----------	399
Professional	6.1	7.0	6.5	124	868
Business	6.4	6.8	6.6	507	2,942
Skilled trade	7.7	7.6	7.6	203	1,096
Backache:					
Agricultural	----------	6.2	----------	----------	271
Professional	2.5	2.8	2.6	50	346
Business	3.7	3.6	3.6	292	1,562
Skilled trade	6.5	5.6	6.0	170	808
Headache:					
Agricultural	----------	22.0	----------	----------	965
Professional	22.2	22.8	22.5	449	2,840
Business	22.1	21.1	21.6	1,743	9,132
Skilled trade	21.6	19.5	20.5	566	2,799
Use of patent medicine:					
Agricultural	----------	7.3	----------	----------	319
Professional	7.7	9.3	8.5	157	1,164
Business	10.3	9.9	10.1	811	4,278
Skilled trade	9.4	10.1	9.7	246	1,447
Habitual use of laxatives:					
Agricultural	----------	20.8	----------	----------	911
Professional	20.5	24.1	22.3	416	3,003
Business	24.6	26.0	25.3	1,938	11,232
Skilled trade	27.0	27.5	27.2	709	3,941

RESULTS OF URINALYSES

In general, the results of the routine urinalyses,[5] which are done for both "field" and "head" office in the Institute's laboratory, do not show marked differences in the four occupational groups. The data are recorded for persons of all ages by occupational groups in Table 23, without further comment, for such interpretation as may be given by the medical reader.

TABLE 23.—*Frequency of certain results of various urinalyses findings in the four occupational groups*

Nature of impairment or disease and occupational group	Per cent of persons examined			Number of persons showing specific impairments	
	At head office	In field	Average	At head office	In field
Albumin, slight trace:					
Agricultural	----------	16.4	----------	----------	648
Professional	17.4	13.7	15.5	341	1,559
Business	19.3	14.5	16.9	1,469	5,753
Skilled trade	21.2	15.5	18.3	538	2,020
Albumin, definite trace:					
Agricultural	----------	1.8	----------	----------	72
Professional	1.7	1.1	1.4	34	120
Business	2.1	1.5	1.8	163	585
Skilled trade	3.0	1.4	2.2	76	184
Albumin, marked amount:					
Agricultural	----------	.43	----------	----------	17
Professional	.61	.40	.50	12	46
Business	1.2	.45	.82	88	178
Skilled trade	1.5	.57	1.0	37	74
Pus:					
Agricultural	----------	8.7	----------	----------	341
Professional	12.6	9.2	10.9	247	1,055
Business	14.4	9.7	12.0	1,100	3,833
Skilled trade	15.6	9.9	12.7	396	1,293
Casts, hyaline:					
Agricultural	----------	10.1	----------	----------	398
Professional	10.9	8.5	9.7	214	969
Business	12.7	9.2	10.9	968	3,636
Skilled trade	14.7	9.6	12.1	375	1,255
Casts, granular:					
Agricultural	----------	6.0	----------	----------	239
Professional	8.0	5.0	6.5	156	565
Business	9.5	5.3	7.4	720	2,091
Skilled trade	11.2	5.7	8.4	285	747
Low specific gravity:					
Agricultural	----------	1.8	----------	----------	72
Professional	5.7	3.4	4.5	112	383
Business	5.5	2.8	4.1	421	1,109
Skilled trade	3.7	2.1	2.9	94	273
Sugar, trace:					
Agricultural	----------	5.7	----------	----------	224
Professional	5.5	5.4	5.4	108	619
Business	5.5	5.3	5.4	416	2,121
Skilled trade	6.3	5.2	5.7	160	682
Sugar, marked amount (1 per cent or more):					
Agricultural	----------	.20	----------	----------	8
Professional	.36	.37	.36	7	42
Business	.59	.43	.51	45	170
Skilled trade	55	44	.49	14	57
Blood:					
Agricultural	----------	.18	----------	----------	7
Professional	.25	.19	.22	5	22
Business	.22	.22	.22	17	86
Skilled trade	.35	.20	.27	9	26

[5] Some individuals were not given the test, but the population has been corrected for this difference.

COMPARISON OF RATES OF CERTAIN IMPAIRMENTS FOR OCCUPATIONS WITHIN THE "BUSINESS" GROUP

A combination of executives, merchants, etc., of salesmen, etc., and of clerks into a "business" group was made because no essential differences were found in the impairment rates among these three subgroups. Table 24 is presented to bring out this general fact. It is limited to the more important impairments. Since marked differences exist in the age distributions of these three occupational groups (see p. 1329), no attempt is made to give rates except for specific ages. To save space, the rates for the "field" examinations alone are given. No careful examination of this table is necessary to reveal the fact that in these three occupational groups the rates of prevalence of impairments are closely parallel, except in a few instances of doubtful statistical significance.

TABLE 24.—*Age prevalence of certain impairments in the three subdivisions of the business group ("field")*

Nature of impairment and subdivision of business group	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+
	PER CENT							
Defective vision, total:								
C. Executives, merchants, etc	39.3	38.8	40.4	43.5	48.4	64.5	78.1	65.8
D. Salesmen, etc	36.7	37.1	41.5	43.7	48.9	63.1	80.0	83.4
E. Clerks	35.6	40.9	44.6	46.0	49.5	67.4	77.1	82.3
Defective hearing:								
C. Executives, merchants, etc	3.8	5.6	7.0	8.0	9.4	12.1	16.5	25.7
D. Salesmen, etc	5.5	5.6	6.9	8.2	10.4	12.9	16.1	24.9
E. Clerks	5.0	4.7	7.0	8.7	9.9	12.8	18.7	24.3
Enlarged, cryptic, diseased, buried tonsils:								
C. Executives, merchants, etc	31.7	33.8	32.1	29.7	25.1	23.3	21.2	16.5
D. Salesmen, etc	33.9	33.2	30.9	29.2	25.8	23.1	20.1	21.3
E. Clerks	29.4	30.4	28.8	28.3	24.3	20.4	20.1	15.8
Nasopharyngitis:								
C. Executives, merchants, etc	8.8	8.9	9.1	8.0	7.8	7.2	7.0	6.3
D. Salesmen, etc	10.1	9.6	8.9	8.9	8.4	7.3	6.3	6.0
E. Clerks	8.3	9.6	9.1	9.5	7.4	8.3	9.3	8.1
Slightly infected gums:								
C. Executives, merchants, etc	4.5	8.4	10.6	11.8	13.2	13.6	15.1	13.2
D. Salesmen, etc	5.9	7.2	9.2	10.2	11.5	12.8	13.6	14.5
E. Clerks	4.6	6.5	8.8	9.3	10.5	13.6	14.1	15.3
Carious teeth, septic roots:								
C. Executives, merchants, etc	10.1	10.0	10.8	12.6	14.8	13.5	12.0	14.3
D. Salesmen, etc	9.3	10.5	11.0	11.6	13.4	13.1	15.2	16.0
E. Clerks	9.1	9.9	11.6	12.1	14.4	15.3	15.9	19.3
Pyorrhea, definite:								
C. Executives, merchants, etc	.8	3.0	4.5	4.8	6.9	7.6	7.8	8.5
D. Salesmen, etc	1.2	2.0	3.2	4.3	6.3	6.9	8.8	8.7
E. Clerks	1.2	2.1	3.4	3.3	6.9	6.8	6.6	9.0
Enlarged heart:								
C. Executives, merchants, etc	1.5	1.3	1.1	2.0	1.7	2.7	2.9	5.8
D. Salesmen, etc	1.8	1.3	1.4	1.8	1.8	2.7	4.2	5.8
E. Clerks	1.9	1.6	1.8	1.5	2.4	4.4	5.3	9.0
Valvular lesions:								
C. Executives, merchants, etc	3.4	2.4	2.0	2.1	1.4	2.3	2.8	4.9
D. Salesmen, etc	2.8	2.3	2.2	1.9	2.6	2.7	3.4	5.7
E. Clerks	4.3	3.6	3.3	2.6	2.9	3.0	3.2	5.9
Arterial thickening, moderate or marked:								
C. Executives, merchants, etc	.8	1.5	1.3	1.1	1.4	2.7	3.7	6.3
D. Salesmen, etc	.6	.8	1.2	1.5	1.9	2.5	3.6	7.8
E. Clerks	.5	.9	1.1	1.3	2.7	3.3	6.9	9.6
Arterial thickening, slight:								
C. Executives, merchants, etc	3.3	6.2	4.7	6.8	8.6	9.7	13.9	20.2
D. Salesmen, etc	4.6	4.5	5.1	6.8	7.5	8.0	13.2	19.8
E. Clerks	3.3	4.2	4.3	5.9	7.7	9.2	16.3	21.9
Hernia:								
C. Executives, merchants, etc	1.3	2.2	3.2	4.3	5.7	7.1	9.1	12.3
D. Salesmen, etc	1.8	2.4	2.9	3.9	6.1	7.6	8.8	14.7
E. Clerks	1.5	2.5	2.4	4.0	6.2	8.2	8.2	12.7

TABLE 24.—*Age prevalence of certain impairments in the three subdivisions of the business group ("field")*—Continued

Nature of impairment and subdivision of business group	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55+
	PER CENT							
Constipation:								
C. Executives, merchants, etc	29.0	29.7	32.6	31.0	33.7	32.6	33.0	31.8
D. Salesmen, etc	29.2	30.9	31.8	34.1	33.4	33.1	34.8	33.9
E. Clerks	28.4	32.9	35.9	34.2	36.2	35.8	33.6	38.2
	NUMBER							
Defective vision, total:								
C. Executives, merchants, etc	156	461	805	813	1,058	1,130	985	1,014
D. Salesmen, etc	353	990	1,488	1,105	1,454	1,323	1,096	1,147
E. Clerks	634	1,057	1,048	1,069	634	569	422	448
Defective hearing:								
C. Executives, merchants, etc	15	67	139	154	205	211	208	397
D. Salesmen, etc	53	150	248	329	309	271	221	343
E. Clerks	88	122	165	197	127	108	102	132
Enlarged, cryptic, diseased, buried tonsils:								
C. Executives, merchants, etc	126	402	639	500	548	408	267	254
D. Salesmen, etc	327	888	1,107	836	768	484	276	293
E. Clerks	522	786	677	731	311	172	113	86
Nasopharyngitis:								
C. Executives, merchants, etc	35	106	181	167	171	126	89	97
D. Salesmen, etc	97	255	318	257	249	153	86	83
E. Clerks	148	249	214	198	95	70	51	44
Slightly infected gums:								
C. Executives, merchants, etc	18	100	212	165	289	239	191	203
D. Salesmen, etc	57	193	330	391	343	268	186	199
E. Clerks	81	169	206	290	135	115	77	83
Carious teeth, septic roots:								
C. Executives, merchants, etc	40	119	216	214	323	237	151	221
D. Salesmen, etc	90	281	393	488	397	274	209	220
E. Clerks	162	256	272	309	184	129	87	105
Pyorrhea, definite:								
C. Executives, merchants, etc	3	36	89	94	151	133	98	131
D. Salesmen, etc	12	53	114	211	187	144	120	120
E. Clerks	21	54	80	118	89	57	36	49
Enlarged heart:								
C. Executives, merchants, etc	6	16	21	27	37	48	37	89
D. Salesmen, etc	17	36	51	63	53	56	58	80
E. Clerks	33	41	42	48	31	37	29	49
Valvular lesions:								
C. Executives, merchants, etc	13	29	42	48	33	41	34	76
D. Salesmen, etc	29	63	82	70	79	60	47	78
E. Clerks	81	95	78	56	39	26	17	32
Arterial thickening, moderate or marked:								
C. Executives, merchants, etc	3	18	25	23	31	46	47	105
D. Salesmen, etc	6	22	43	61	57	53	49	107
E. Clerks	8	23	26	28	35	28	38	52
Arterial thickening, slight:								
C. Executives, merchants, etc	13	74	94	104	187	169	175	311
D. Salesmen, etc	44	121	184	217	222	167	181	273
E. Clerks	59	109	102	168	99	78	89	119
Hernia:								
C. Executives, merchants, etc	5	25	62	71	125	125	116	190
D. Salesmen, etc	18	64	105	143	183	160	120	202
E. Clerks	27	62	55	105	80	69	45	69
Constipation:								
C. Executives, merchants, etc	115	353	649	604	737	570	417	490
D. Salesmen, etc	281	825	1,141	1,027	992	699	477	466
E. Clerks	505	851	845	762	464	302	184	208

COMPARISON WITH MORTALITY DATA

Space does not permit an adequate comparison here with mortality and morbidity data. The data heretofore available have been carefully summarized by Collins (3) in a recent publication on the relation of economic status and health. Special reference, however, may be made to the Registrar General's (England and Wales) Occupational Supplement for 1921–1923 (4) (5) which gives differential death rates from important causes according to social

groups. In Table 25 the English comparative mortality figures[6] are shown for four groups which are roughly comparable to the four used in the present study, namely, farmers; upper and middle (corresponding roughly to professional); intermediate; and skilled trade. The business group is no doubt made up of persons from both upper and middle and intermediate groups. Only the important causes of death are included.

TABLE 25.—*Standardized mortality (comparative mortality figures) of males 20–65 years of age in England and Wales, 1921–1923: Farmers, upper and middle, intermediate, and skilled trade, by cause*

Cause of death	Farmers	Upper and middle (Social Class I)	Intermediate (Social Class II)	Skilled trade (Social Class III)
All causes	674	812	942	951
Influenza	734	835	937	934
Tuberculosis (all forms)	462	508	855	978
Respiratory tuberculosis	414	489	844	977
Syphilis, aneurysm, general paralysis of insane, etc	262	727	911	963
Cancer (all sites)	724	798	920	990
Diabetes	1,311	1,246	1,451	918
Cerebral hemorrhage, etc	717	884	1,029	996
Diseases of circulatory system	666	930	1,012	930
Diseases of the heart	684	820	998	931
Valvular diseases of heart	705	569	902	964
Other heart diseases	663	1,062	1,091	899
Diseases of respiratory system	486	634	759	918
Bronchitis	230	256	548	937
Pneumonia	592	828	841	895
Diseases of digestive system	985	1,274	1,225	884
Peptic ulcer	880	905	968	968
Appendicitis	1,629	1,697	1,427	888
Cirrhosis of liver	781	1,625	1,865	656
Chronic nephritis	722	994	1,128	968
Suicide	1,235	1,156	1,276	905
Accident	751	809	700	949

(Registrar General's Decennial Supplement, England and Wales, 1921, Part II. Occupational mortality, fertility, and infant mortality, p. cxxiii.)

Since Table 25 does not give data for the lower social classes, for which no comparable information is available from the physical examinations, the contrast in the impairment rates according to social class appears much less than that shown by mortality data for a larger range of social classes in England. But, even if we had impairment rates and mortality rates resulting from these impairments for strictly comparable social groups, it is reasonable to expect that, on the whole, differential death rates would exhibit wider variations according to social class than differential impairment rates. This, for the reason that the wealthier and more intelligent class would take greater advantage of medical and other facilities for correcting or mitigating the effects of impairments after they manifest themselves in sickness or by other definite symptoms.

It is obvious, of course, that no specific comparisons of the English report and our study can be made. The general indications undoubtedly are similar. It may be noted that the relatively low rate among

[6] That is, the standardized rates by social class are obtained for each disease for the ages 20–65 and divided by the corresponding rate for all occupied and retired

farmers for respiratory impairments (which are all of the upper respiratory tract) is consistent with the English mortality from diseases of the respiratory system in the farmer group. Although the impairment rates for heart diseases are not widely different in the broad occupational groups, the farmers show the lowest rate and the skilled trade group the highest. In the mortality data it will be found that the farmers also have the lowest rates, and the intermediate and skilled trade groups are highest. The same tendencies are found in the rates of hardening of the arteries in the Life Extension data. The comparative mortality figures were not given in the British volume for this disease alone, but examination of the rates by age showed that the mortality among farmers was relatively low for this condition. The professional group, however, did not have as low mortality rates as the intermediate and skilled trade classes.

No other disease groups, for which the rates are not approximately the same for each occupational group, seem sufficiently comparable to be discussed.

SUMMARY

By way of summary, it seems desirable to present a bird's-eye view of what has been given in detail in the tables and graphs. This has been attempted in a final table in purely qualitative terms. The impairments whose rates differ rather widely among the broad occupational groups are listed on a chart in which each group heads two columns, one marked "high," for the impairments in which that group has rates above average, and one marked "low," for the impairments in which that group has rates below average.

Only the outstanding differences are considered, since it would be confusing to include instances which are barely significant statistically or where the differences are of no practical importance. The "head" office and "field" data are not considered separately, but the consistency of the results in the two divisions has been taken into account.

Although actual rates or differences have not been shown, (M) has been used to indicate that the difference is marked, (S) that it is slight, and a question mark (?) that the authors could not be sure that the difference was statistically significant, but felt that the condition was of sufficient interest to be mentioned.

It is possible from this table to see rather clearly what the broad differences are. For most conditions, the agricultural group would seem to have rates definitely below the average for all examined, but there are important exceptions, notably for teeth, stomach and abdominal conditions, and the genitourinary system. The rates are low for diseases of the eye and ear, nose and throat, heart and pulse, blood vessels, and many miscellaneous conditions.

TABLE 27.—*Summary of rates of impairment in broad occupational groups as to whether higher or lower than average*

[S=slight difference; M=marked difference; (?) indicates that it is doubtful whether difference is significant]

	Agricultural		Professional		Business		Skilled trade	
	High	Low	High	Low	High	Low	High	Low
Eye and ear.		Defective vision—Corrected (M). Uncorrected. Diseases of external eye (?). Perforation of ear-drum (?). Wax in ears.	Defective vision—Corrected.	Defective vision—Uncorrected. Defective hearing (S).			Defective vision—Uncorrected (M). Defective hearing (M) (ranks highest in most of group).	Defective vision—Corrected.
Teeth.	Carious, septic (M). Pyorrhea, definite (M).			Carious, septic (M). Slightly infected gums. Pyorrhea, definite (M). Insufficient dentistry (S).		Carious (S). Pyorrhea, definite (S).	Carious, septic (M). Slightly infected gums. Pyorrhea, definite. Insufficient dentistry.	
Nose and throat.		Deflected septum. Enlarged and diseased tonsils (M). Nasopharyngitis (M). Hypertrophic rhinitis (M).					Frequent colds (S).	
Respiratory.	Asthma (?).					(Tendency to rank lowest in this group.)	Bronchitis.	
Heart and pulse.	Slow pulse, per cent with.	Functional murmur. Valvular (S). Rapid pulse, per cent with.					Valvular (S). Enlarged (S).	
Arterial thickening.		Arterial thickening (S).		Arterial thickening (S).			Arterial thickening (M).	

Stomach and abdominal.	Gastric disorders. Tenderness gall bladder region (M). Tenderness appendix region. Hernia (S).	Constipation (M). Weak inguinal rings. Hemorrhoids (S). Habitual use of laxatives.		Hernia (S).			Constipation. Habitual use of laxatives (S).	
Genitourinary.	Enlarged prostate. Frequent urination (M).			(Tendency to rank lowest in this group.)				
Brain and nervous.	Neurasthenia.	Nervousness. Exaggerated reflexes.	Nervousness.					
Miscellaneous.	Dizziness. Backache.	Adenitis. Chronic skin. Use of patent medicines. Enlarged thyroid. Varicocele.	Chronic skin. Mastoids.	Backache.			Backache. Insomnia. Use of patent medicines. Varicose veins.	Mastoids (?).
Urinalyses.	Albumin.	Low specific gravity, per cent with (tendency for sugar, pus, blood to be low).	Low specific gravity, per cent with.	(Tendency for sugar, pus, blood, casts to be low.)			Albumin (tendency for sugar, pus, blood, casts to be high).	

The professional group conforms more nearly to the average for the entire population considered. Few conditions are found to have excessive rates; but on the other hand, there are not very many with particularly low rates.

The business group approximates the average for the entire population considered in nearly every respect.

The skilled trade group stands out distinctly from the others in a number of respects. Its rates of impairments are excessively high for eye and ear, teeth, heart and pulse, and many miscellaneous conditions. The desirability of a study of the rates of impairments in the specific occupations making up this group is suggested.

Again, it should be emphasized that one could not expect in this study to find very marked differences, since the lower social levels are but slightly represented in the data.

ACKNOWLEDGMENTS

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REFERENCES

(1) Sydenstricker, Edgar, and Britten, Rollo H.: The physical impairments of adult life—General results of a statistical study of medical examinations by the Life Extension Institute of 100,924 white male life insurance policyholders since 1921. Journal of Hygiene, January, 1930.

(2) Sydenstricker, Edgar, and Britten, Rollo H.: The physical impairments of adult life—Prevalence at different ages, based on medical examinations by the Life Extension Institute of 100,924 white male life insurance policyholders since 1921. Journal of Hygiene, January, 1930

(3) Collins, Selwyn D.: Economic status and health—A review and study of the relevant morbidity and mortality data. Public Health Bulletin No. 165, U. S. Public Health Service.

(4) Registrar General's Decennial Supplement, England and Wales, 1921, Part II: Occupational mortality, fertility, and infant mortality. London: 1927.

(5) Britten, Rollo H.: Occupational mortality among males in England and Wales, 1921–1923.—A summary of the report of the Registrar General. Public Health Reports, U. S. Public Health Service, vol. 43, No. 25, June 22, 1928, pp. 1565–1616. Reprint No. 1233.

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A SAFETY PROGRAM *for* BUILDING TRADES UNIONS

Charlotte Todes
(Organizing Secretary, Workers' Health Bureau)

read before the



FIRST NATIONAL LABOR HEALTH CONFERENCE

Cleveland, Ohio, June 18-19, 1927

under the auspices of the

Workers' Health Bureau of America
799 BROADWAY, NEW YORK





A SAFETY PROGRAM FOR BUILDING TRADES UNIONS

Charlotte Todes, Organizing Secretary, Workers' Health Bureau

The National Labor Health Conference has brought together workers from the Construction Industry, one of the most important in the United States, capitalized at six billion dollars and employing more than four million men. It is second only to the railroad industry in the number of workers employed and the amount of money invested. In the brief span of ten years, new machinery and mechanical equipment, as well as speed-up methods have been introduced in building construction. Skyscrapers and other stupendous structures are completed almost overnight to satisfy the feverish demands of the investors. This "building boom" can be figured in terms of crushed and maimed bodies. The bones, sinews and blood of workers have paid the dividends. Each day newspapers tell of deaths and injuries to workers from derricks crashing to the ground, from blasting and wrecking operations, from plunges down elevators or floor openings, or from scaffolds and ladders which collapse under the weight of the materials and men.

Startling Increase in Accidents Among Building Trades Workers

Accurate figures of accidents and deaths in the construction industry have never been determined. Only a few States record these accidents; most States have inadequate statistics or no records at all. Careful estimates show that at least 2,000 building workers are killed each year, 10 every working day, an accident rate higher than any other except the mining industry. In four States, New York, Pennsylvania, Ohio and California, over 56,000 accidents were reported in 1926, of which 600 were fatal.

New York

The New York State Department of Labor in August, 1926, reported a startling increase in accidents among workers on buildings. "While in the last two years reported deaths in manufacturing decreased 26 per cent, those in the building industry increased

61 per cent"; this despite a decrease in building activity and in the number of workers employed.

Pennsylvania

Pennsylvania also reported an alarming increase. During the first six months of 1926, 105 workers had been killed and 9,000 injured, an increase of 44 per cent in two years. The situation was serious enough to force the Department of Labor to take every safety inspector from his regular work for a period of six weeks to supervise construction operations. Deaths and injuries to carpenters were found to be approximately three times greater than in any other occupation in the building trades. Plumbers and steamfitters ranked second in the number of accidents, structural iron workers third in the number of accidents but second in the number of deaths; painters and paperhangers, roofers, electricians, bricklayers, plasterers and masons following next in order. This indicates that accidents occur in greater numbers to workers in the building industry who do most of their work on scaffolds, ladders or swings. Bricklayers, masons and hodcarriers have similar hazards but the number of accidents were fewer, probably because the scaffolds were sturdier and more substantially constructed to bear the weight of heavier materials. Twenty per cent of the building accidents in Pennsylvania were due to falls from ladders, scaffolds, buildings, runways, floors, stairs, and other elevations through floor openings and excavations. Ninety-three per cent of these falls which resulted in injuries occurred while the workers were busy handling tools or materials. Sixteen per cent of the deaths were due to falling objects; 13 per cent were caused by cranes and derricks.

Ohio

A recent report of the Superintendent of the Division of Safety and Hygiene of the Ohio Industrial Commission shows that in 1926 the Construction industry was responsible for more than 22,000 accidents, 10 per cent of all the accidents in the State. Of these 189 were fatal, 16 per cent of all deaths from accidents. Since workers in building and construction represent only 10 per cent of the workers in Ohio, this fatal accident rate is abnormally high and indicates that "the building industry is less careful than others." Here again the major causes of death were: falls, falling objects, handling objects, stepping on or striking against objects, cranes and other machinery.

California

From California we have reports of an increased number of fatal as well as permanent injuries. During 1924 and 1925 there were more than 12,000 accidents reported and 59 deaths, while in the following years 1925 and 1926, accidents had increased to more than 14,000, of which 84 were fatal.

Illinois

In Illinois it is significant that among the accidents reported during 1926, 82 were found among children under 18 years of age. One boy of 17, a water boy employed on a building under construction, fell to the ground from a scaffold on the fifth floor and was killed.

One-fifth of the accidents in the building industry occur among the youth. Boys and young men face serious dangers which may result in disfigured and crippled bodies, a lifetime of hardship and struggle.

Most of the accidents and deaths in the construction industry could have been prevented if the ladders, scaffolds and other equipment had been built and maintained substantially and securely, if ample guard rails, toe-boards, overhead protection and proper guards for derricks and other machinery had been provided. Safeguards must be installed *in advance* of the collapse of scaffolding, the snapping of cables, the caving-in of embankments, the failure of shoring timbers, the breaking of derrick masts and booms. In England in the 17th century a derrick was an apparatus for executing condemned persons, named after Derrick, a hangman. It is not such a lengthy step in history from 1600 to 1900. Derricks have changed but little. Then men were executed on derricks intentionally, now they are killed through the negligence and disregard of the employers.

The Opposition of the Employers

Employers can be directly charged with the responsibility for the present sacrifice of workers in the building industry. They not only are indifferent and negligent about providing safeguards on their own jobs, but they are to a large extent responsible for the failure of the States to enact legislation. Through powerful lobbies and other coercive methods, they block the efforts of labor to gain protective measures. The employers regard legislation for safe-

guarding workers as interfering in their affairs. Their opposition to legislation and trade union initiative in protecting the health of workers is evidenced by a statement made in 1926 by the secretary of the Construction Section of the National Safety Council, in outlining the problems before this Section. (We have) he said, "The problem of increasing our membership and selling the idea of accident prevention through the use of voluntary codes before legislative codes are forced upon us." . . . "The contractors who have failed to interest themselves in this kind of activity (safety) will have only themselves to blame if they find that their employees have stepped in and are doing some dictating." . . . "If the contractors do not assume the initiative in such work their position of leadership will be undermined to the extent that the work will be carried on by other agencies."

In 1920 the National Safety Council agreed to organize a Committee to formulate a Construction Safety Code to serve as a model for State legislation. This Committee produced a comprehensive code which after four years of discussion was finally referred to the General Contractors' Association for approval. Thus far the Contractors have not accepted, showing not only their opposition to a legislative program but their efforts to interfere with the publication and adoption of this important code. Additional evidence of the indifference of building contractors to safety is clearly shown by the fact the Construction Section of the National Safety Council has a membership of only 86 contractors for the entire country after eight years of organization. The Council admits "that in view of the urgency and importance of accident prevention in construction, the membership is pitifully small."

The safety work of the employers is based on considerations of cold, hard cash. Safety must pay in terms of reduced compensation premiums, less labor turnover and waste, increased production and profits. The following argument is typical: "When things go wrong . . . if an accident occurs, the compensation cost may be $5 or $10 for one man injured to a minor extent, but the cost to the employer when something like that happens is property damage, the delay in carrying on the job, in forfeits and lack of bonuses for not keeping the job up on time, in training men, time of foremen, superintendent, which all together amounts to four times the cost to the insurance carrier. This is a business incentive to do accident prevention work."

The hard boiled, dollars and cents point of view with which the employers regard safety is again revealed by a safety engineer who

was sent to supervise the wrecking of a flour mill which had burned. . . "I questioned the men as to their experience. Two young physical giants were in the crew. I asked these two who were brothers if they had ever worked in high places. . . They had painted crows nests on battleships during the war. That was assurance for me, so I sent them to the highest and most dangerous places. Both were single men. What has 'single' to do with the matter? Well, in Wisconsin it costs $5,800 when a married man is killed and only $1,200 when a single man is killed." This is what a worker's life means to the employers.

The Failure of State Laws

State regulations for the protection of Building Trades workers have not kept abreast of the need to combat the new dangers developing as a result of increased building activity. 27 States have no special codes nor even regulations in the labor laws to safeguard the lives of workers engaged on buildings under construction, demolition or repair, leaving this responsibility to the cities and towns. The municipalities usually lack funds to make exhaustive investigations of the problem and adopt hit-or-miss regulations depending on the amount of pressure exerted by the trade unions. In Connecticut, for example, we have information from five cities, each of which has drawn up and enacted its own building regulations without uniformity or even similarity in the provisions. This inefficient and wasteful procedure could be eliminated if the State would formulate and enforce a Safety Code. The Building Commissioner of Portland, Oregon, at the annual meeting of the Building Officials' Conference in April 1927, criticized the method of single cities adopting codes stating that "Building officials are developing model codes which cities may adopt. One is being prepared by the Pacific Coast Building Officials' Conference. This code, although not in its final form, has already been enacted by Sacramento and Alhambra, Cal. The Florida State Building Officials' Conference is using it as a model for a uniform code for that State, and commissioners in other sections of the country are studying it."

"A similar movement is under way in Kansas, where building inspectors and other officials are discussing a code which may serve all the cities in that State."

"These codes fix the general requirements, which are the same for all parts of the country, but are so written that local authorities can insert provisions which have a direct bearing on the community or conform to existing State laws."

The present chaotic method of adopting building codes by cities fails to make adequate provision for the protection of workers, and

discriminates against workers in the same State by varying and conflicting measures. Organized workers in the building industry must vigorously attack this method and demand State-wide protection.

In addition to the 27 States which have no safety codes, 14 States* have no codes but contain provisions in the labor laws, covering workers on buildings. There is no uniformity among these State laws, and such regulations as exist are woefully inadequate. In most instances no attention is given to sanitary requirements. New Jersey has a few provisions relating to the construction and guarding of scaffolds. Illinois made a step beyond this and includes a few regulations for the guarding of floor openings and hoists and the provision of signal systems for hoisting apparatus. Michigan has nothing but a regulation, providing temporary toilets on the job. The cities supplement these regulations and provide their own staffs of inspectors for enforcement.

Building Codes Needed in Every State

Workers in the building trades face serious danger to life and limb distinct from the hazards of other industries. Special codes must, therefore, be drafted for their protection. Only six States, California, Massachusetts, Ohio, Wisconsin, Pennsylvania, and New York, and the District of Columbia, have enacted such codes to safeguard building trades workers. The State of Washington provides for the protection of workers on buildings in a set of safety standards. Each State differs in its regulations. With the exception of the District of Columbia, all the codes specify the type of lumber and material which shall go into the making of scaffolds, ladders, runways, stairs, etc., how these shall be constructed to insure safety, the devices to be used to prevent injuries from falling objects, the guards for floor and other openings, the proper and efficient installation and operation of machinery.

Requirements for sanitary facilities and first-aid equipment vary. Such provisions as drinking water, dressing rooms, place to eat lunch, away from building operations, and adequate toilets are entirely lacking in the laws of Washington, Wisconsin, and the District of Columbia. First-aid equipment is not required on the job in Massachusetts, New York, and Washington, D. C. No State provides the maximum sanitary conveniences.

Employers who violate the safety regulations in Ohio and Wisconsin must pay extra indemnities to workers who have been injured or killed as a result of their negligence. In Wisconsin, compensation and

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* Colorado, Kansas, Michigan, Minnesota, Maryland, New Jersey, Rhode Island, Wyoming, Texas, Illinois, Nebraska, Louisiana, Montana, Oregon.

death benefits are increased 15 per cent and levied directly on the employer as a special fine. Treble compensation is paid to young workers who have been injured while employed without permit or at a prohibited employment. Working on scaffolds or at heavy work in the building trades is a prohibited employment for children under 16. In Ohio, the employer who violates the law is penalized by an extra compensation indemnity of 15 to 50 per cent.

Enforcement of safety provisions depends on the size and training of the staff of inspectors. That employers continually violate the law is generally known. This situation will not be controlled until ample appropriations are made for the appointment of an adequate staff of safety inspectors. New York State employs only twelve inspectors who supervise the safety of 400,000 workers in the construction industry. This is a typical example.

Shall organized labor accept this chaotic method of regulating dangerous working conditions? Is there any reason why workers in Pennsylvania and Ohio should have greater assurance of protection on the job than workers in New Jersey, Michigan, or Connecticut? Should not the workers in the 41 States which now provide little or no protection be granted the same safeguards which are provided in other States? Organized labor must demand and fight for adequate safety and sanitary codes for buildings under construction, demolition and repair in every State in the Union. State Labor Departments should be responsible for the maximum inspection and enforcement of such codes in every city and should make co-operative arrangements with the cities for the use of their inspectors for this purpose.

The Task Before Organized Labor in the Building Trades

The time has come for organized building trades workers to call a halt to the ghastly waste of workers' lives in the building industry which is showing so startling an increase. Labor cannot depend on the voluntary action of individual employers for protection on the job, and can count only on their opposition when it comes to legislative campaigns. Never before in the history of the trade union movement have the unions acquired the strength and power which organized building trades workers have today. The building trades unions have a membership of more than one million. They have successfully fought bitter struggles to undermine the standards of wages and hours gained through their strength and solidarity. They have pushed forward the movement for the five-day week. Brother Tracy, in his report to the 1926 National Convention of the Building Trades Department, Amer-

ican Federation of Labor, stated: "The building trades unions have weathered the storm of open-shop attacks, company union schemes and wage-cuts . . . low wages and bad conditions of employment cannot long prevail where workers of an industry unite their efforts in a forward and upward movement."

The loss of 2000 workers on buildings each year as a result of unsafe condition of work can and must be prevented by the organized power and economic strength of the unions in the building trades. The unions must demand safe and healthful working conditions in their agreements by direct negotiations with the employers and in the State laws by initiating a campaign for uniformly high safety standards.

Health Agreements

Agreements with employers must carry clauses assuring the maximum protection for workers on the job. These can be enforced by a union safety committee which will constantly be on the watch for possible danger points, and which will investigate and recommend new and better methods for protection. The committee can keep records of injuries and causes of accidents and furnish valuable evidence to injured workers in establishing their claims for compensation, as well as statistical data to initiate legislation for the improvement of safety codes. The Building Trades Councils of New York City and Newark, N. J., have already instituted the idea of safety committees. Failure on the part of the employers to provide safe and healthful conditions of work should be as flagrant a violation of the trade agreement as a reduction of wages or lengthening of hours. Organized labor must be ready to fight for this protection, even to strike for it.

Uniform State Codes, Adequate Inspection, Rigid Enforcement

A safety code for Building Trades workers has been prepared by the Workers' Health Bureau which should serve as a basis for a national standard for the unions to introduce into every State legislature and to include in every trade agreement. A special section of this code applies to the painting industry which has serious hazards due to the poisonous materials to which painters are exposed. Years of study and scientific investigation have been devoted by the Bureau to the formulation of regulations covering such provisions as the prohibition of Benzol and Wood Alcohol, the Control of Lead Dust, the Prohibition of Open Spraying, Provisions for Adequate Ventilation and Special Sanitary Requirements.

A trade union committee on Safety Codes should review these recommendations with a view to testing their practicality and giving each craft in the building trades the opportunity of adding such regulations as may suit the particular needs. Specifications for all equipment and machinery must be determined upon and careful consideration must be given to sanitation and first-aid protection for workers. Methods for adequate inspection and rigid enforcement must be included.

We recommend to the delegates of the National Labor Health Conference the appointment of a Committee to include representatives from each craft in the building trades with the necessary technical assistants to work in co-operation with the Workers' Health Bureau in carrying out this program.

NOTE:—The Conference unanimously endorsed the appointment of a National Trade Union Safety Standards Committee for the Building Trades to work out National Standards for Protection in co-operation with the Workers' Health Bureau.

UNITED STATES PUBLIC HEALTH SERVICE

RUPERT BLUE, SURGEON GENERAL

INDUSTRIAL CONDITIONS

THEIR RELATION TO THE PUBLIC HEALTH

BY

B. S. WARREN

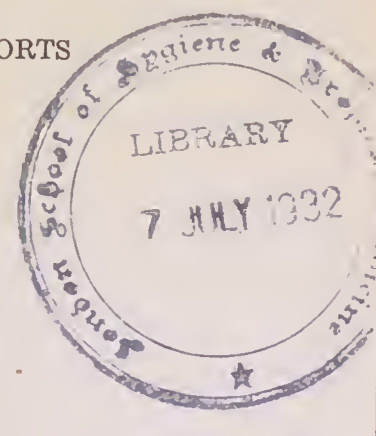
Surgeon, United States Public Health Service, and Sanitary Adviser, United States Commission on Industrial Relations

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INDUSTRIAL CONDITIONS.

THEIR RELATION TO THE PUBLIC HEALTH.[1]

By B. S. WARREN, Surgeon, United States Public Health Service, and Sanitary Adviser, United States Commission on Industrial Relations.

In the study of methods for the prevention of disease investigators have found that many of their problems are industrial and economic and that success in disease prevention very largely depends upon the proper adjustment of the industrial relations of employer and employee upon a basis that will permit employer and employee to live according to hygenic standards.

The Duty of Public Health Workers in the Adjustment of Industrial Relations.

The public-health forces should cooperate with those at work on these economic problems. They can thereby add to the powerful influences already working for industrial betterment and can help not only to obtain sanitary shops, but also to secure the better adjustment of industrial relations which are so potent in lowering the resistance of the individual employee and of all those who are dependent on him for a livelihood. There is the further necessity for health departments to cooperate in the adjustment of these relations where it is found that the deleterious effects extend to communities and are in a large part indirectly responsible for slum districts, alley dwellers, and low standards of living. The necessity for such cooperation is so clearly obvious that little need be said to prove the contention.

The national campaign for the study and prevention of tuberculosis has developed the fact that practically all persons at one time or another have the germs of the disease introduced into their bodies, and that these germs remain there without causing any apparent damage until the resistance of the individual is lowered from some cause due to inheritance and environment. There is little doubt that industrial conditions are frequently responsible for the environment which is active in lowering individual resistance.

This deleterious environment resulting from existing industrial conditions begins to exert its blighting influence with the beginning of life itself. It puts its stamp on the child yet unborn. It continues its influence through infancy and childhood. This handicap is carried

[1] Reprint from the Public Health Reports, vol. 29, No. 22, May 29, 1914. Read before the Health Officers' Conference of the State of Louisiana, Apr. 20, 1914.

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by the child of the industrial worker when he enlists all too soon in the ranks beside his parents to bear the burden of the maximum of the industrial load.

In view of the well-recognized fact that disease affects more readily people with lowered resistance, whose bodies present conditions more favorable to the development of disease than do the bodies of average persons, it becomes necessary to study every circumstance in the occupation of the sick and disabled industrial worker, because occupation largely determines the environment, which is such a potential cause for lowered resistance.

Existing Industrial Conditions.

Published reports of existing industrial conditions, so far as they relate to hygiene and sanitation, show too clearly that by far the larger portion of our industries are not operating in a manner to give the workers proper hygienic conditions.

To quote from the report of the New York State Factory Investigating Commission, which investigated 7 per cent of the 45,000 establishments in that State, where there were employed 18 per cent of the 1,000,000 wage earners of the 45,000 establishments:

> In many of the industrial establishments in the State the conditions of work have been found to be excellent, the management giving proper regard to the health and comfort of the employees, and the organization being model in all respects. Everything in reason has been done for the workers, and a high standard of efficiency has been maintained.
>
> Unfortunately such model establishments and such enlightened employers are in the minority, as by far the greater number of employers have not yet awakened to the importance of improving conditions of labor. Investigations in a great number of factories throughout the State have revealed much that is deplorable. In the production of commodities great economy must needs be practiced as a matter of course; but there is a tendency on the part of many employers to economize not only in matters of legitimate expense, but also in space, light, air, and certain other safeguards to the health and lives of the workers. Such false economy inevitably injures the employer and imperils the health and lives of his employees.

Conditions in New York State are probably no worse than in other parts of the United States. It is probable that what is true of New York State is true for the United States and that such is the average to be found in all the States, especially those which are industrial centers.

The sanitary survey of the State of Louisiana is apparently as complete as any State survey made up to the present time. The partial results published by the State board of health in the Quarterly Bulletin of March 1, 1914, indicate that over 50 per cent of all the establishments in the State are in "poor" or "bad" sanitary condition. Unfortunately extensive investigations, like those made in New York and Louisiana, are rare.

Physical conditions of the places of employment are not the only factors in producing disease for which industrial conditions are responsible, but they may be taken as an index of hygienic conditions. It usually follows if physical conditions are "poor" hygienic conditions are also "poor," though it does not always follow if the former are good that the latter are also good. Other and equally important factors are to be found in the long hours of labor, which cause exhaustion; poor wages paid; and the irregularity of employment, which further reduces the income so that the worker and those dependent upon him are of necessity poorly housed, poorly fed, and poorly clothed. Low wages are facts, not theories. Statistics show that in the 20 leading industries of the United States the average income of the heads of households is less than $500 and that the total average income of the households is $721 per annum; that the average household consists of 5.6 persons and lives in a home at an average rent of $9 per month.

Estimating the cost of food at 30 cents per diem per adult and children at half that rate, the rent and food cost per annum per household would be $611 or a little less than the total income, leaving $110 for clothing, heating, lighting, recreation, and incidental expenses. These statistics are taken from the report of the Immigration Commission, which made a study of 15,726 households. It is the total environment of industrial workers which must be considered in the search for the causes of disease. The analysis of this environment must include the place of employment, the home, the places of rest, recreation, amusement, and the like.

Responsibility for Existing Conditions.

The responsibility for their environment does not by any means rest altogether upon the workers. No one is able to choose every part of one's environment, and this is especially true of many workers who have little or no choice, but must accept what is offered in the way of employment, and must also accept the home and other environment for which they can pay with the wages earned. This will continue to be true, especially in the unskilled group, so long as the supply of laborers is greater than the demand and the competition for employment makes it possible for the employer to fix the terms of employment. There are many conditions for which the industry is responsible outside of the place of employment. This is especially true where the industry controls the community. The same is true of large cities where the combined industries control through the fact that a large part of the population is directly or indirectly dependent upon them.

Hygienic Standards.

Hygienic standards are those requirements which are necessary to be maintained that men may live free from those influences which operate to cause disease either directly or indirectly.

When men live together in groups, large or small, individual rights must often be sacrificed for the community interest and property rights must be subordinated to the rights of man where the necessity arises.

This principle has been well recognized in matters of health administration in most cases. For example, where an article of commerce is likely to affect the health of the consumers, even though a small group, control has been permitted to the health authorities, but where an article of commerce is produced under circumstances which affect the health of large groups of producers little control has as yet been exercised over the deleterious influences. These are the influences which must be considered by health authorities of industrial centers. In fixing hygienic standards for industrial communities effort should be made to fix the responsibility for maintaining hygienic requirements.

These requirements naturally fall into three groups: Those for which the industry is responsible, those which depend upon individual effort, and those which must be left to public regulation. These fields of responsibility often overlap, and active cooperation by all concerned is necessary for proper enforcements.

The industrial establishments of the United States are so many that proper supervision by the State is prohibited by the cost, and it is only by the division of the authority as indicated at the end of this article that success may be expected.

In the campaign for prevention of disease there are many requirements which are of importance to a greater or less degree, and none should be neglected by those responsible for their enforcement, but four are of such vital importance that they may be considered fundamental, for little headway can be made in disease prevention until these are in effect. They are:

1. Hours of labor which do not cause excessive fatigue or cause damage to any part of the body.

2. Regular employment at a wage sufficient to meet the cost of hygienic living and insure against sickness or other physical disability.

3. Sanitary environment in the place of employment.

4. Education as to methods of hygienic living and the importance of such living.

Fatigue.

Work performed by any of the body cells produces waste products and other changes in the cells. Up to a certain limit, work, with the

resulting changes in the cells, is beneficial and improves the physical condition of the cells, but when the work is excessive, too prolonged, or too fast, waste products begin to accumulate, the cells become exhausted, the proper changes fail, and if the cells are not properly rested damage results. If the work is continued without proper rest early breaking down and failure of the individual to perform his task are the final results.

When fatigue begins, by increasing the effort the worker may continue his pace, but as fatigue increases, greater and greater effort is required to keep his pace, until the breaking point is reached.

When the hours of labor are so prolonged or the strain is so great that the night's rest is not sufficient to restore the body cells to normal, the worker begins his day's work partially fatigued and can not keep his pace without greater effort than that required of the same individual when properly rested. The exhaustion lowers mental and physical resistance, and need of stimulation causes many to drink, at times to excess, when under other conditions they would lead comparatively sober lives. This has been demonstrated in the Engis Zinc Works. The hours of labor were cut down from 12 to 8 hours per day, the men earned as much and did as much work in 8 hours as they did formerly in 12, there was a marked decrease in the calls upon the sick fund, the men no longer felt the need of stimulation, drunkenness on duty was no longer noted, and sobriety was markedly increased.

Wages.

Regular employment at wages sufficient to meet the cost of hygienic living is the sine qua non of all the requirements. It does not take an expert in disease prevention to tell us that an underfed, poorly clothed, poorly housed group of people are going to prove easy prey to the germs of influenza, pneumonia, tuberculosis, and similar diseases. Neither does it take a deep and prolonged study of wages, cost of living, and housing conditions of the working people of the United States for us to know that a large percentage of them are living on a scale greatly below a hygienic minimum. To illustrate, we find that in the annual report for 1913 of the joint board of sanitary control in the garment trade in New York City, which represents 85,000 men and women workers, the following statement:

> The most of the harm to the health of the workers is due to long hours, overexertion on piecework, overfatigue at rush seasons, and worry during the absence of work.

Representatives of the Phipps Institute report similar conditions in Philadelphia.

Conditions are no better in St. Louis, where Schwab, after a study made among 7,000 garment workers, found that 25 to 30 per cent suffer from neurasthenia. According to his view, the nerve weakness

is due largely to overfatigue, speeding up on piecework during the rush season, and the lack of work during the prolonged slack season and the worry incident thereto.

In the same city the Jewish Alliance Exchange found that a very large majority of demands made upon the society for relief were due to sickness, and whether the sickness was the cause of lack of employment or not, the two conditions were so intimately related that permanent cure was not thought possible without adjusting the employment at a living wage.

When a substantial part of any community is working on a level much below a hygienic minimum there will be an increasing demand upon the charity organization, especially on account of sickness.

In fact, the index of the general effects of industrial conditions upon a community may be obtained by ascertaining the amounts expended for relief work by charitable and other organizations. When the industries fail to meet the cost of hygienic living by their employees, the burden is shifted to the public.

Sanitary Environment in Places of Employment.

The sanitary conditions of the places of employment have a distinct and direct bearing in the causation of disease through poor general conditions, poor lighting, heating, and ventilation, overcrowding, excessive humidity, and special conditions of deleterious gases, fumes, dusts, poisons, and the like. These conditions are so obviously causing disease and are so prevalent in so many industries and causing so much direct injury to the workers that the general public have come to consider these as the full extent of the damages for which industrial conditions are responsible.

The occupational diseases are so directly due to the employment that in many cases they could with little modification of the law be made to come under the workmen compensation acts.

The reports of the lead industries made by Alice Hamilton show such bad sanitary conditions that measures are being enacted to regulate those industries.

Conditions are no better in the chemical and dusty trades in New York State, as shown by the report of the factory commission.

Education.

It is not necessary to quote from reports showing the harmful effects of long hours, low wages, and poor sanitary conditions; they are matters of such common knowledge as to cause little comment except when some unusually bad condition is found.

It is evident that no great progress can be made in disease prevention in the industries until employers and employees are educated on the subject, have a practical knowledge of what constitutes hygienic

living, and are impressed with the importance of health in producing efficiency and a settled status in the conditions of employment.

Education as to the requirements of hygienic living has been the subject of much discussion, but as yet the business world and the workers have not come to fully realize the importance of the requirements and the results to be obtained. Up to the present time the activities along this line have been mainly confined to a cleaning-up campaign or to what may be called welfare work and placing the physical environment at the place of employment in sanitary condition. There is great need for these improvements; they are the most obvious things to do and will improve labor conditions and demonstrate what may be expected by further improvement. Many lives will be saved in this way, especially in the chemical trades and the dusty trades, but the great mass of workers are to be reached through the improvements in hours and wages.

The great need is to demonstrate to the business world that there is an optimum of hours of labor, speed, and nutrition for the industrial worker, which if adhered to will bring his output up to the maximum of quality and quantity and that at the optimum the worker will have fewer stoppages on account of accident or disease and will last the longest time in a profitable producing state.

In other words, the worker will not have to go to the hospital for frequent disabilities when at the age of best production, and will not be sent to the "scrap heap" when there should be many more years of profitable service if worked in accordance with hygienic standards. If worked at the optimum time, speed, and nutrition, there will be no great loss to the business in the final cost results, because in most cases the increase in quality and quantity of output brought about by the reduced hours of labor will offset to a great degree the increased cost.

It is not well to promise a complete offset as to cost when changed to the optimum, but it is safe to say that the consumer or public will not suffer, because the cost is already borne in the extra charges now made for free hospitals, charity organizations, and the like.

Establishments have made the change from 12 to 8 hours a day or from 9 to 8 and the increased cost has been offset by the increase in the hourly output. The instance of the Engis Zinc Works mentioned above is a case in point, and it is a recorded fact that the cost of production was decreased 20 per cent when the hours were changed from 12 to 8 per day.

The clearest case of record is probably that of the Zeis Optical Works, Germany.[1] There Abbe kept a careful record for the years 1899–1900 of every cost when the plant was operating on a 9-hour day. In 1900–1901 the day was reduced to 8 hours. The records

[1] Fatigue and Efficiency, by Goldmark.

showed that the men earned over 3 per cent more than during the previous year, the output of the work for the 8-hour day was increased 3 per cent, and the power plant was able to be shut down an hour earlier. The record was for 233 men at an average age of 31 years, and many different occupations on a piecework basis were represented in the shop.

Relation of the Public Health Worker to the Industrial Warfare.

Employers must be shown that the healthy man is the most efficient and the cheapest employee, and that any reasonable expense to maintain him in health is a profitable investment.

Employees must be convinced of the results to be expected from the maintenance of hygienic standards and that much of the responsibility is theirs.

The responsibility has been so thoroughly fixed on the employees by the protocol agreement among the garment workers in New York City that sanitary strikes are authorized.

It is at this point that the public health worker can act as a mediator between capital and labor and aid greatly in the amicable adjustment of the strife which is now so prevalent in the industrial world. Hope for improvement lies first in demonstrating the facts to those most interested—employer and employee. This is the field of the public-health organizations of the country, Federal, State, and local.

It is a matter of regret that medical men have not worked to greater purpose in this field. In the seclusion of hospitals they have worked with commendable success in curing the sick and wounded who have been coming in ever increasing numbers from this field, but they have neglected too long to preach methods of disease prevention and have gained a reputation in the business world for being impracticable, and for this reason the task will be harder to convince business men of the practicability of their plans.

Physicians must bring from the hospitals records in such form and in such volume that the business men will be convinced.

For this purpose case studies must be made in the hospitals located in industrial centers and careful records made of all, so that the doctors' knowledge will not be a matter of unrecorded experience and impressions, but recorded facts which will have greater weight as evidence. For this purpose competent men must study the laborers in their daily life before they become subjects for the hospital. This study must include the total environment and if possible untangle the bundle of influences that in effect are producing disease more surely than the germs which are the direct agents.

At present the laborers are to a degree playing the card of "horrible insanitary conditions" in places of employment to win public opinion

without a true realization of what hygienic standards mean. For this reason the necessity is the greater for physicians to take up this work in the industrial warfare and as impartial investigators present the facts and remedies to both sides.

To maintain this unbiased point of view, doctors, especially those connected with Federal, State, and local governments, should be kept independent of the commerce and the labor departments of the various governments, but must always stand ready to cooperate with both. The real responsibility, however, rests with the industrial workers themselves after they are informed on the subject. States may enact laws, and labor departments may make every effort to enforce them, but the sanitary control of the industries of the United States involves such an extensive field and such a multitude of shops that it is not practicable under existing conditions for the States to employ sufficient inspection force for efficient supervision. Because of this, the industries must undertake it themselves, and to this end employers and employees must organize and assume the responsibility.

Many industries have grown to such proportions that their internal government is as complex and extensive as city governments. At present, most industries are under control of the owner, and the employees have little or no voice in their control, but there is evidence of a beginning transition stage to democratic form of government. This stage of revolution may be peaceable, and there is reason to believe that the contending forces may be able to get together on certain basic principles, and to find in hygienic standards, among other things, a field for joint control on which to meet and work out further agreements. It should be easy to convince employers of the justice of accepted hygienic standards, and equally easy to show employees the great benefit which will accrue to all concerned by including in trade agreements recognition of these standards. There is one striking example of this method of joint control which has now been in successful operation for over three years.

Operating under the protocol agreement of the cloak, suit and skirt, and dress and waist industries of Greater New York, in which there are over 85,000 employees, the joint board of sanitary control has been successful in cleaning up a large proportion of the shops in the city. With these results accomplished as a beginning, the board feels that it can take the next step and it is now studying other matters affecting the health of the employees, and the movement for control of all hygienic standards may grow out of the agreement. At any rate, sufficient has been accomplished to demonstrate the practicability of the plan and to commend it for trial by other industries.

Before such a plan can be adopted, however, there must be some kind of organization of the employers and employees, and the stronger both organizations become the more responsible they become and the greater the probability for success of the plan.

Sickness Insurance.

There is another remedy, one that would probably prove more effective in preventing sickness than any other that has been proposed, and that is insurance in case of sickness or disability. When some one is forced to pay a definite amount in actual cash for every case of sickness among the industrial workers, those who must pay are going to become very active in the search for the cause and prevention of sickness. The financial interest is more likely to be successful than the academic or legislative. That this may be expected is demonstrated by the present activity in accident prevention in those States where workmen's compensation laws are in operation.

Managers are organizing "safety first" movements, spending substantial sums to investigate the causes of accidents, compelling foremen to use every means to prevent accidents, and organizing their men into safety first associations.

In those countries where compulsory sick-insurance laws are in force, the benefits derived have already been sufficient to prove their worth and that greater benefits are to be expected.

It is not intended to discuss the details of the plans here, but it may be stated that the laws provide only for those employees who work for wages or small salaries; the funds are provided by payments by employers of one-third to one-half and by employees one-half to two-thirds of a sum fixed by the State; in certain cases where the wage is very small the State contributes a part of the share to be paid by the employee. The German law provides that in no case shall the amount to be paid by the employee be more than 4½ per cent of his basic wage.

The benefits provided are chiefly medical relief in case of sickness or injury, the payment of a part of the weekly wage for a period of 26 weeks, and a pension in case of disability beyond a period of 26 weeks. There are many other small benefits provided.[1]

In Great Britain and Germany the medical relief includes sanatorium treatment and measures to prevent disability. These contemplate all hygienic measures to prevent sickness. At first there was much opposition on the part of physicians, but these differences have been adjusted.

Mr. Lloyd George is authority for the statement that 20,000 of the 22,500 general practitioners are registered under the English act; that during the past year the Government had paid to physicians for

[1] For further details see copies of laws in Department of Labor Bulletins Nos. 102.

medical services $22,500,000; and that the average income of the physicians had been increased $750 to $1,000. This increase meant more work, but it also meant that millions of people were receiving medical attention who previously had none at all, that a general health survey of the British nation was being made, and that the State, through the doctors, was going down to rescue many poor wretches from the conditions under which they lived.

These statements by Mr. Lloyd George demonstrate clearly that a greater influence for disease prevention has been set in motion by insurance against sickness, which fixes a money value to be paid for every case and fixes a definite financial gain to the industries in preventing sickness.

The present condition of the industries in the United States presents an ever-increasing need for the services of medical men, not only in their individual capacity for relief of sick and injured, but in the broader capacity as protectors of public health.

In conclusion, I will quote from Dr. Christopher Addison, of the University of London:

> The State, however, has no right to ask any class of men to do the impossible. It confronts the medical profession with 600,000 ill-nourished children in our elementary schools, with 300,000 who have adenoids, etc.; it deplores the waste of infant life; it points to an army of factory girls and women workers with anemia, chronic indigestion, etc.; and it is beginning to say to the medical profession, "We want these things altered. We want these people to be healthier. Will you help us to treat them?" It would be invaluable if the medical profession after fair, complete, and organized consideration, but in a full and fearless manner, were to say to the State:
>
> "Yes! We will turn to the task with all good will and do the best we can, but we can not undertake to make these children healthy by drugs. They need good food, fresh air, a clean and well-ventilated home. So long as these things are absent, so long as many of these children, with too little sleep, pass half their hours in the stuffy, stagnant air of an overcrowded room, so long will they crowd into our clinics and out-patient departments."
>
> I hope also that they will add: "We claim also that those whose duty it is to make reports on the conditions of labor and home life of the people should be free to tell the truth, and the whole truth without fear or favor. These anemic girls, these dyspeptic women, are not to be put right by medicines alone. The hours they work, the conditions they work under, are often also concerned, as well as their habits of life and diet. It is useless for us to tell people to take proper food who have not the means of obtaining it, who sometimes are ignorant of how to cook it when they get it, and who often enough are paying what should be an economic rent for a decent home but are obtaining only tenement quarters without any facilities for decent life. It is the duty of the State to use its schools and other agencies to the full and give to the people a knowledge of these matters, of an appreciation of the value and meaning of cleanliness and temperance, and of other things which are of so grave importance in their daily life." There is no limit to the usefulness of a proper and enlightened cooperation between the medical profession and the State, and its influence would be felt in every department of national life.

Hygienic Requirements (Outlined According to Responsibility).

A. EMPLOYERS' RESPONSIBILITY.

1. Mental and physical fitness of employees. Physical examination prior to employment, and periodically thereafter.

2. Wages.

(*a*) Adequate to maintain the employees as to (1) proper food, (2) clothing, (3) hours for rest and recreation, and thereby maintain an efficient and healthy mind and body.

(*b*) Increase or promotions according to length of service to provide for family and increase in family.

(*c*) Adequate to save for old age or pay for old-age pension.

3. Place of employment.

(*a*) General sanitary conditions, (1) proper heating, (2) proper humidity, (3) proper lighting, (4) no overcrowding, (5) proper ventilation, (6) proper cleaning, (7) clean water supply.

(*b*) Special dangers, (1) substitute harmless or least dangerous material for use of dangerous material whenever practicable, (2) safe handling of dangerous material by mechanical devices, etc.

(*c*) Removal of dust, gases, and fumes.

(*d*) Safeguarding against accidents.

(*e*) Equipment necessary for personal hygiene, (1) washing facilities, (2) toilets (3) rest rooms, (4) lockers, etc.

4. Mental and physical energy expended.

(*a*) Hours of labor, (1) length of work day, (2) overtime, (3) night work.

(*b*) Fatigue; (1) rest, recreation, and sleep necessary to eliminate waste and restore body cells prior to beginning day's work; (2) posture, speed of work or attention required, which causes unusual strain to be eliminated where practical, or adequate rest periods to be allowed; (3) monotony of occupation as cause of fatigue.

5. Age and sex of employees.

(*a*) No child labor under 14 years.

(*b*) No night work for women, young people, or children.

6. Compensation for sickness and accident incident to employment.

7. Regular employment in so far as practicable.

8. Medical supervision by company physician.

(*a*) Prompt medical and surgical aid.

(*b*) Sanitary inspections.

(*c*) Elimination in an equitable manner of the mentally and physically unfit.

9. Contribution to sick insurance fund.

10. Education of employees.

(*a*) Prevention of disease.

(*b*) Prevention of accidents.

(*c*) Special rules for dangerous processes.

B. EMPLOYEES' RESPONSIBILITY.

1. Home environment.

(*a*) General sanitary condition as to (1) heating, (2) humidity, (3) lighting, (4) overcrowding, (5) ventilation, (6) cleanliness, (7) clean water supply.

(*b*) Special sanitary condition.

(*c*) Personal hygiene, obtain proper (1) food, (2) clothing, (3) bathing, (4) rest, (5) recreation and avoidance of dissipation.

2. Places of recreation.

(*a*) General sanitary conditions.

(b) Special sanitary conditions.
(c) Personal hygiene, no dissipation.
3. Regular employment.
(a) Seek employment.
(b) Prompt attendance.
4. Procuring medical and surgical relief in case of sickness or accidents.
5. Contribution to sick insurance fund.
6. Education.
(a) Prevention of sickness.
(b) Prevention of accidents.
(c) Special rules for dangerous processes.
(d) Study to increase efficiency and fitness for promotion or increase in pay.

C. STATE RESPONSIBILITY.

1. Housing—home, shops, places of amusements, etc.
(a) Sanitary building regulations.
(b) Special regulations governing sanitation.
(c) Sanitary inspections.
(d) Licensing of dangerous trades.
(e) Personal hygiene requirements.
2. Regulations of hours of labor.
(a) Day and night, to prevent exhaustion.
(b) No night work for women, young persons, or children.
(c) No child labor under 14 years.
(d) Overtime to be eliminated where practicable.
3. Minimum wage scale.
4. Medical supervision.
(a) Free hospitals for indigents.
(b) Dispensaries for-indigents.
(c) Regulations governing medical attendance in certain industries.
5. Pure-food regulations.
6. Pure water supply.
7. Special measures to prevent disease.
8. Regulation of social insurance or compulsory sick and old age insurance.
9. Education of those concerned.

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HEALTH OF GARMENT WORKERS

THE RELATION OF ECONOMIC STATUS TO HEALTH

BY

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AND

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WITH AN INTRODUCTION BY
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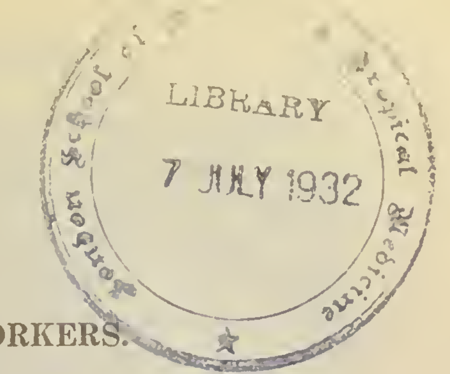
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HEALTH OF GARMENT WORKERS.

THE RELATION OF ECONOMIC STATUS TO HEALTH.[1]

Introduction.

By J. W. Schereschewsky, Surgeon, United States Public Health Service.

During the summer of 1914 the condition of the health of garment workers in the women's garment trades in New York City was investigated by the Public Health Service at the solicitation of the joint board of sanitary control of these trades. Part of the investigation consisted of careful physical examination of some 3,000 garment workers, 2,000 males and 1,000 females. This examination involved the collection of a large mass of data consisting not only of bodily measurements and facts as to the physical status, but also of other data of a social or economic character. In the report of this investigation, published as Public Health Bulletin No. 71, the data collected were tabulated with a view to bringing out the chief points of interest relative to the state of health of such workers. Because, however, of the self-evident relation between the economic status of the worker and his condition of health, these data might furnish interesting facts if tabulated from this standpoint.

In the following paper by Surg. B. S. Warren and Public Health Statistician Edgar Sydenstricker, the data collected in this investigation have been submitted to such an analysis, with convincing results. As remarked by these writers, while it is well understood that poverty and ill health go hand in hand, data showing this objectively are rare in the literature. The publication of additional data of this character must, therefore, always be regarded as a distinct contribution to the foundations for improving the physical welfare of man.

Health of Garment Workers in Relation to Their Economic Status.

By B. S. Warren, Surgeon, and Edgar Sydenstricker, Public Health Statistician, United States Public Health Service.

The conclusion suggested by the vocational study of the health of garment workers in the cloak, suit, and skirt industry in New York City, which was conducted by the United States Public Health Service, was that "no vocational diseases peculiar to garment workers"

[1] Reprint from the Public Health Reports, vol. 31, No. 21, May 26, 1916, pp. 1298-1305.

existed, although the effect of sedentary occupations, such as the women's garment industries, was to intensify the bad effects of certain defects or diseases or to produce them in predisposed individuals and in this way impair the health and efficiency of the workers. It was suggested that low wages and irregularity of employment were important factors in causing certain conditions of ill health, as, for example, tuberculosis and neurasthenia.[1]

Although the investigations and observations of those familiar with conditions among low-paid wage earners go to show that economic conditions have marked effects upon the health of wage-earners and their families, there is a general lack of statistical data indicating these effects. The suggestion referred to above was so directly in line with such statistics and observations as are available that the data secured in the course of the vocational study were examined and tabulated on the basis of differences in the economic status of the garment workers as indicated by their annual earnings, in order to exhibit whatever relation might exist between their earnings and their physical condition. Such a use of the data on physical status was possible because data were obtained at the same time on average weekly earnings and average annual earnings of each worker. Furthermore, data were also secured at the time of the physical examinations showing the number of children, both living and dead, of each married male worker, thus affording indications of the size of the families of this group of workers as well as permitting computations of child mortality in these families. Since the great irregularity of employment in the garment industry has been found to be an important factor in determining the economic status of the workers, a consideration of the relation between their weekly and annual earnings in connection with the data on physical status was also believed to be pertinent. As indicators of the general physical status of the workers, the data bearing on the state of their nutrition, the hemoglobin percentages, and incidence of tuberculosis were selected for purposes of comparative tabulations. Only male married garment workers were included in these tabulations.

In the following pages are briefly presented (1) A classification of male married garment workers according to annual earnings on the basis of the adequacy of annual earnings to afford incomes sufficient for the maintenance of families under healthful living conditions; (2) Certain data on the child mortality in the families of these workers and on the physical status of the workers themselves according to income groups; and (3) Data indicating the degree of the regularity of their employment according to income groups.

[1] Public Health Bulletin No. 71, United States Public Health Service: Studies in Vocational Diseases. I. The Health of Garment Workers, by J. W. Schereschewsky, Surgeon United States Public Health Service, pp. 94, 97, 98, and 100

CLASSIFICATION OF WORKERS ACCORDING TO INCOME.

In making a classification of the male married garment workers according to their annual earnings, two considerations were deemed to be of especial importance. First, that the differences between the earnings of the lowest and highest groups should be sufficient to exhibit marked difference in economic status, at the same time including in each group a sufficient number of heads of families to represent conditions typical of each group. Second, that each worker should be a member of a family and that his annual earnings should be regarded, as far as possible, as an indicator of the economic status of his family. With these considerations in mind, the following classification was made:

Families whose heads annually earned—	Number for whom data were secured.	Average annual earnings.
Less than $500	381	$382
$500 to $699	581	577
$700 and over	462	866

That the annual earnings of family heads thus classified indicate the economic status of their families is an assumption strengthened by several considerations arising from the character of the families included in the data. First, the possible additions from earnings of children to family income appear to be small in any of the three groups. The majority of family heads were under 35 years of age, the average age in the lowest income group being 37, in the middle group 35, and in the highest group 32. The possibility of having children old enough to increase materially the family income is thus apparently slight. Second, it would appear that the profit from boarders and lodgers was almost negligible. Only one family in three in the lowest income group and one out of every two in the two higher groups had any other person in the household than parents or children.[1] Third, the tendency in Hebrew garment workers' families to rely upon the earnings of wives is very small, as investigations of garment workers' families have shown.[2]

[1] This is corroborated by the data obtained by the Federal Immigration Commission for Hebrew garment workers. Less than 15 per cent of the Hebrew garment workers' families investigated by the commission were found to have any income from payments of lodgers or boarders, which was a lower percentage than that found in any of the other racial groups in the industry. (Reports of the U. S. Immigration Commission, vol. 11, p. 311.)

[2] The investigations of the Immigration Commission into families of garment workers showed that only about 4 per cent of Hebrew families had an income from the wives, and that the proportion of total family income from the earnings of wives was less than 1 per cent, a proportion lower than that found in families of any other race. (Ibid, pp. 311, 313.) The same condition was found by the Federal Bureau of Labor in its investigation of men's clothing workers in New York City. Although families where wives were employed were sought by the Bureau of Labor for purposes of its study, less than 10 per cent of the wives in Hebrew families were found to contribute to family income, either by working in factories and shops or by doing contract work at home. This proportion was much less than that prevailing in families of other races. (Report on Condition of Woman and Child Wage Earners, vol. II, p. 358.)

The earnings of the family head may therefore be said to indicate with a fair degree of exactness the general economic status of the family. The lower limit of $700 for the highest income group was determined upon after considering the average income of the group ($866) and making allowance for possible additions to the family income from other sources. The basis for the consideration was the estimate that it required $800 to $900 annual income for the average family of five persons to maintain a healthful standard of living in New York City. Intensive budgetary investigations of wage-earners' families in New York City have afforded bases for several determinations and estimates of a minimum "adequate" family income in which a fundamental consideration was the minimum annual amount necessary to maintain a wageworker's family of five persons (man, wife, and three dependent children under 14 years of age) under healthful conditions of living. These determinations and estimates agree that an annual family income of between $800 and $900 is the minimum amount necessary for this purpose in New York City.[1] It would thus appear that the group of male garment workers earning $700 or more

[1] See R. C. Chapin: Standard of Living in New York City; Mrs. L. B. More: Wage-Earners' Budgets; New York Factory Investigating Commission: Fourth Annual Report, Vol. IV, Appendix VII. The Cost of Living in New York State; New York City Bureau of Standards: Report on the Cost of Living for an Unskilled Laborer's Family in New York City, submitted to the Committee on Salaries and Grades of the Board of Estimate and Apportionment. Prof. Chapin's and Mrs. More's determinations were the results of investigations of several hundred wage-earners' families in New York City in 1907. The New York Factory Investigating Commission's determination of a minimum family income was made under the direction of Prof. F. H. Streightoff, and was largely based on Prof. Chapin's data and further data obtained by original investigations of wage-earners' families in 1914. The data used in the above determinations, together with some additional data, formed the basis for the New York City Bureau of Standard's determination in 1915.

These estimates are summarized in the following table:

Estimates of minimum annual income adequate for wage earners' families in New York City.

Items of expenditure.	Chapin, 1907.	More, 1907.	Factory commission, 1914.	Bureau of standards, 1915.
Food	$359	$364	[a] $325	$380
Rent	168	168	200	168
Fuel and light	48	40	20	42
Clothing	114	100	140	104
Car fare	16	(b)	31	30
Insurance	17	35	36	23
Health	22	(b)	22	20
Sundries	71	143	103	73
Total	813	850	876	840

[a] The cost of food for a family of 5 persons (man, wife, and 3 children under 14 years) appears to be low when compared with the estimates of Prof. Chapin and Mrs. More seven years before, when retail food prices were much lower than in 1914, and when compared with other costs of food at New York prices. The New York Factory Investigating Commission's estimate of a per capita food cost per day for adult males is 27 cents. (See Fourth Annual Report, Vol. IV, p. 1640.) This is the same as the daily cost of ration for an adult male in the United States Army at wholesale prices in 1914. The average cost of a well-balanced daily ration at the New York Marine Hospital for all inmates, including employees, was 35 cents per day in 1914. This ration is calculated to furnish 3,000 to 3,500 calories per day, an amount which is considered sufficient for a man at ordinary labor. On this basis, the annual cost for a family, as defined above (3.3 male units) would be $420. The marine hospital ration was purchased from retail merchants under annual contract.

[b] Included in "Sundries."

a year may be said conservatively to include those families which have an adequate annual income for the maintenance of healthful conditions of living. Even if the middle group should contain some families with adequate incomes, there can be little doubt that the families in the lowest group, whose heads earn less than $500—averaging only $382 a year—do not have adequate incomes. An additional fact to be considered is that the families in the lowest income group had a larger number of children per family than those in the two higher groups. This would tend to make the per capita income relatively smaller than that indicated by the statistics presented. The number of children per family in the three income groups is shown in the following table:

Annual earnings of family heads.	Average total number of persons per family.	Average number of children per family.
Under $500	5.36	2.99
$500–$699	5.33	2.78
$700 and over	4.88	2.43

HEALTH OF GARMENT WORKERS ACCORDING TO INCOME.

Using the foregoing classification according to income—the highest income group including those with what might be considered an adequate family income and the lowest groups including those with income plainly inadequate for maintaining healthful conditions of living—the data relative to child mortality and physical status of the heads of the families are briefly summarized in the following paragraphs:

Child mortality.—The mortality rate of children in the lowest and highest income groups showed the following variations:

Annual earnings of heads of families.	Total number of children.	Average number children born per family.	Average number children living per family.	Average number children dead per family.	Per cent of mortality among children.
Under $500	1,434	3.78	2.99	0.78	20.69
$500–$699	1,961	3.34	2.78	.56	16.72
$700 and over	1,270	2.75	2.43	.32	11.65

As these statistics show, the per cent of mortality of children in the group where heads of families earned less than $500 a year was 82 per cent greater than, or nearly twice as high as, the per cent of mortality of children in the group where the family heads earned $700 or more a year. These data indicate the same general variations in

child mortality among families of different incomes as those shown by some other recent investigations.[1]

Nutrition of garment workers.—The percentage of male married garment workers in a state of poor nutrition showed wide variations in the three income groups. Approximately twice as great a proportion were poorly nourished in the group earning less than $500 a year as in the group earning $700 or more a year, as shown in the following tabulation:

Annual earnings of family heads.	Total number.	Per cent classed as "poor" in nutrition.[a]
Under $500	372	25.00
$500–$699	566	15.02
$700 and over	456	12.72

[a] While the personal equation of the examiner is undoubtedly a factor in the classification of an individual as to his state of development and nutrition, nevertheless, such observations are of value. (Schereschewsky: sup. cit. p. 37.)

Anemia.—Determinations of the percentage of hemoglobin of each garment worker showed marked differences among the individuals in the three income groups. Those showing hemoglobin percentages below 80 were classed as anemic, the Talquist scale being used in making the determinations. The proportion of individuals having hemoglobin percentages under 80 was over twice as high in the group earning less than $500 a year as in the group earning $700 or more a year. It is interesting to note that not only was the proportion of anemic individuals greatest in the lowest income group, but the average hemoglobin percentage was lowest in that group. The results of the tabulations on the basis of income are presented below:

Annual earnings of family heads.	Total number.	Average hemoglobin index—Talquist.	Per cent with hemoglobin index under 80.
Under $500	372	85.94	9.94
$500–$699	566	86.99	5.65
$700 and over	456	87.35	4.42

[1] An investigation of infant mortality by the Federal Children's Bureau in Johnstown, Pa., showed that in families where the father earned less than $521 a year, or less than $10 a week, the infant mortality rate was 255.7 as contrasted with 134.7 for the community as a whole, and 101.4 in families where the father earned $900 or more a year. (Infant Mortality—Results of a Field Study in Johnstown, Pa., p. 45.) In a similar investigation in Montclair, N. J., the children's bureau found that the infant mortality rate in families where the income was less than $12 a week was more than twice as high as in families where the income was $23 or more a week. Both of these investigations were of births (excluding stillborn) among families of all incomes in the localities during a year. A study of infant mortality in Fall River, Mass., in 1913 showed that a much higher rate was prevalent among families of low-paid textile workers than in other families (L. I. Dublin: Infant Mortality in Fall River, Mass. American Statistical Association Publications, XIV: 505–520). A study of mortality in Birmingham, England, by Robertson, showed that in families where the father earned less than a pound a week the infant mortality was 196 in 1910 and 211 in 1909 as contrasted with 127 in 1910 and 146 in 1909 in families where the father earned a pound or more a week. (John Robertson, M. D., B. Sc.: Infant Mortality in Relation to Factory Labor, Transactions of the Fifteenth International Congress on Hygiene and Demography, Washington, 1912, Vol. III, Part II, p. 950.)

Prevalence of tuberculosis.—The proportion of tuberculous individuals among the garment workers who were heads of families showed extremely wide variations when the highest and lowest income groups were compared. The following tabulation exhibits this comparison:

Annual earnings of family heads.	Total number.	Per cent of family heads tuberculous.
Under $500	372	5.64
$500–$699	566	5.30
$700 and over	456	44

The significance of this wide difference is further seen when the tuberculosis rate in the lowest income group is compared with the average rate found among large numbers of wage earners, without regard to income. The rate for all male garment workers, including the single as well as the married, who were examined, was 3.11.[1] The examination of about 20,000 workers in varied industries in Cincinnati by Robinson showed a tuberculosis rate of 1.1 per cent.[2] The rate of 5.64 per cent in the lowest income group is much higher than the rate found in several other physical examinations of large numbers of wage earners.[3]

IRREGULARITY OF EMPLOYMENT.

No discussion of the relation of economic conditions to the wage-worker's health in the garment industry should leave out of consideration the great irregularity of employment.

As a recent investigation of the regularity of employment in this industry has shown,[4] the year is made up of two busy seasons and two dull seasons, each lasting from 12 to 14 weeks. Thus for about one-half of the year there is a serious lack of employment for the workers in the industry. The economic significance to the worker of this seasonal irregularity is seen in the facts that nearly one-half of the workers are without opportunity for employment in the industry in the dullest seasons, and that less than 18 per cent of them are regularly employed throughout the year. It is evident, therefore, that the competition among workers in this industry is great

[1] Schereschewsky: sup. cit. p. 94.

[2] U. S. Public Health Service Bulletin, No. 73, p. 58.

[3] Examinations by Dr. George M. Price, director of the New York State Factory Investigating Commission, showed the following tuberculosis rates: 800 bakers, 2.4 per cent; 800 tailors, 1.6 per cent; 600 tobacco workers, 1.3 per cent. (George M. Price, M. D.: Occupational Diseases and the Physical Examination of Workers, Transactions of the Fifteenth International Congress on Hygiene and Demography, Washington, 1912, Vol. III, Pt. II, p. 847.) Examinations of over 7,000 employees of the Sears, Roebuck Co., in Chicago, by Dr. H. E. Mock, during a period of five years, showed a tuberculosis rate of 4 per cent. (H. E. Mock, M. D.: An Efficient System of Medical Examination of Employes. Transactions of the Tenth Annual Meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., 1914, p. 44.) All of the rates quoted above are without regard to income of the workers.

[4] U. S. Bureau of Labor Statistics: Bulletin 147, Wages and Regularity of Employment in the Cloak, Suit, and Skirt Industry. See pages 7-68 for data relating to the industry in New York City.

and that a process of selection of those who work more regularly than others is continually in progress. How far efficiency, as measured by physical condition of the worker, plays a part can not, of course, be definitely stated. Nor can it be determined with any degree of exactness whether inefficiency is more of a cause than an effect of the unemployment of any individual worker. The fact, however, is not without significance that the workers in the lowest income group were at the same time in poorer physical condition and were less regularly employed than the workers in the higher income groups.

The regularity of employment of the workers in each of the three income groups is suggested by comparing their full-time weekly earnings when at work with their actual annual earnings.[1] This comparison is shown in the following table:

Annual earnings of family heads.	Average rate of weekly earnings.	Average actual annual earnings.	Per cent of maximum possible annual earnings actually received.
Under $500	$19	$381	38
$500 to $699	23	577	48
$700 and over	27	866	61

It is thus seen that the average worker in the lowest income group received only 38 per cent of what he could have earned had he been able to secure employment for every week in the year at his usual full-time weekly wage. This is in sharp contrast to the 61 per cent received by the average worker in the highest income group.

The situation is clearly suggested, therefore, that the greatest number of poorly nourished, anemic, tuberculous workers in an extremely seasonal industry were in that group composed of the lowest paid and the least regularly employed.

[1] If the rate of weekly earnings is multiplied by 52, the maximum possible annual earnings is obtained for comparison. Thus in the group of those actually earning less than $500, the average weekly income multiplied by 52 would make $988; in the group of those actually earning between $500 and $699 it would make $1,196, and in the group actually earning $700 or more, it would make $1,404.

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Dr. G. H. F. Nuttall

Compliments of C.-E. A. Winslow

THE SANITARY DANGERS OF CERTAIN OCCUPATIONS.

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THE SANITARY DANGERS OF CERTAIN OCCUPATIONS.

BY C.-E. A. WINSLOW, S. M.

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Sanitary authorities exist to protect the citizen against dangers which in his individual capacity he is unable to avoid. First, water supply, milk supply and food supply, must be safeguarded, since the life of every citizen depends upon these necessities. Second, the insidious spread of contagious diseases must be checked, since unrecognized cases of diphtheria or of small-pox menace the safety of all with whom they may come in contact. These two vehicles of disease, infected food and infected persons, threaten every individual in the community and rightly challenge the most ardent efforts of the sanitary engineer and the public hygienist. Of the less general dangers which affect only certain classes of individuals none can, I think, be more important than those connected with trades and occupations. The force of economic necessity too often makes it impossible for the factory operative to escape from the unsanitary conditions which surround him. He is helpless unless the State, or that matured public opinion of which the State is the expression, shall come to his aid. Therefore he has a special claim upon the consideration of such an association as our own.

Thanks to the admirable statistics collected by the Registrar-General of Great Britain, we have a pretty precise idea of the extent to which health may be affected by various trades and occupations. Dr. Tatham's figures, for example, show that the general death rate of Plumbers, Painters and Glaziers, and of Cotton and Linen manufacturers, is nearly twice, while that of Potters, Earthenware manufacturers and File-makers is more

than three times, that which obtains in the professional and agricultural classes. Unfortunately American vital statistics, both State and National, are so inaccurate and so incomplete that comparable data for this country are wanting. Such figures as we possess indicate the same startling discrepancies; and Dr. C. F. W. Doehring in the Bulletin of the U. S. Department of Labor for January, 1903, cites statistics for our own State according to which the average life of factory workers in Massachusetts is only 36.3 years against 65.3 for farmers.

The cause of excessive mortality varies widely in different occupations. Most prominent perhaps are those trades liable to accidents in the operation of machinery. English regulations class under four heads the mechanisms which prove most often dangerous, (a) Prime movers, (b) Mill-gearing and belts, (c) Machines for manufacturing purposes, (d) Hoists and other lifting tackle. Mules, looms, circular saws, planing machines and power presses all add their quota of victims. The manufacture of explosives should be placed under this head, with certain electrical processes in which the liberation of charges of high voltage may be the result of careless handling.

Of far greater importance, although less dramatically impressed upon the public mind, are the harmful effects of those occupations in which the worker is subjected to the breathing of excessive quantities of dust. The increase of tuberculosis and other pulmonary disorders due to this cause is unquestionably the gravest feature in the hygiene of occupations. Dust in various trades differs widely in character, but from the fine metallic particles produced in needle-making to the fragments of stone inhaled by quarrymen and the fine fibrous material which fills the air of a carding-room, all in varying degrees produce their bad effects. Dr. Doehring in the paper above cited gives a list of 38 injurious varieties of dust, and in Dr. Thomas Oliver's classic work on "Dangerous Trades," it is shown that in 19 different dusty industries the death rate from tuberculosis and other diseases of the respiratory system is more than twice that of the agricultural class. The rate among agriculturists being

taken as 100, that of Potters and Earthenware manufacturers is 453, that of Cutlers 407, that of File-makers 373, that of Glass-makers 335, etc. Less serious but yet appreciable is the danger from metallic dust to Miners, Iron and Steel workers, Gunsmiths and Needle-grinders—from stone dust to Masons, Stone-cutters and Cement-makers—from fibrous dust to Shoddy-makers, Rope-makers, Rag-pickers, Cotton and Woolen mill operatives, Carpet-makers, Flax and Hemp carders, and operatives in horsehair factories—from wood dust to Coopers and Carpenters—from flour dust to Millers, Bakers and Confectioners.

Next to dust, excessive temperature and moisture probably contribute most to make certain industries unhealthful. The effect of such conditions upon the general resistance of the organism and particularly upon the vaso-motor system of heat regulation is well understood; and Laundry workers, Glass-blowers, Iron and Steel workers and the operatives in wet spinning rooms pay a heavy tribute of deaths from tuberculosis and other pulmonary disorders in which these form a predisposing cause.

Another important series of industrial disorders are the intoxications due to the introduction into the system of certain metallic poisons. Plumbism is the familiar example of this class. If deaths from lead poisoning among all occupied males be taken as one, the comparative mortality in England is, among Lead workers, 211; among File-makers, 75; among Plumbers, 21; among Painters and Glaziers, 18; among Potters, 17; among Glass-makers, 12, while Copper-workers, Coach-makers, Gasfitters, Locksmiths, Calico printers, Enamellers, Solderers, Type founders and others suffer to a lesser degree. Mercury poisoning occurs among the makers of thermometers and other physical instruments, the makers of incandescent electric light bulbs and other electrical supplies, and in certain more restricted industries. Cases of arsenical poisoning, though becoming yearly more and more rare, are not entirely abolished. Copper and zinc poisoning are not unknown; and chromium sometimes af-

fects workmen in bichromate works and those who use dyes containing this metal.

Still another group of diseases are caused by the fumes of various non-metallic chemical substances. Carbon bisulphide as used in certain processes for treating india rubber and gutta-percha produces severe hysteria and exhaustion. Strong acids and alkalies sometimes overcome the workmen engaged in their manufacture. Benzine, as used in cleansing, and certain other commercial spirits, more rarely cause toxic effects. Here, too, we may mention the manufacture of fertilizer, rendering, bone-boiling, tanning and other industries accompanied by the production of noxious odors of decomposition which slowly undermine the general vitality.

Finally, as a last class of occupation diseases, there are certain bacterial maladies which under unusual conditions may be transmitted by trade materials. Cases of typhoid infection among laundry workers are so common as to warrant their inclusion under this head. Anthrax affecting wool-sorters and the handlers of hides is a typical case in point; and those vocations which bring men much in contact with the lower animals lead, though rarely, to infection with glanders, foot-and-mouth disease and other disorders.

In looking over this list of the dangers to operatives from accident, from dust, from heat and humidity, from metallic poisons, from noxious fumes and from infectious diseases, it seems obvious that most of them are preventable and thus legitimately within the field of sanitary science. The fencing of machinery, with proper regulations as to its operation—the removal of dust by special ventilation and the substitution of processes in which no excessive amount of it is formed—the regulation of humidity and temperature — the government of lead and other chemical factories by such rules as shall prevent the ingestion of poisonous substances — are all practical preventive measures. The problems, however, are various and complex, and each industry requires detailed study and specific treatment. So in England, the country which first took the lead in factory leg-

islation, we find a maze of statutes under the general heading of Mines and Factory Acts, which have gradually grown up year by year to meet the exigencies of individual cases. Beginning in 1802 with an act for preserving the "health and morals" of apprentices in cotton mills, various statutes provided for general sanitary conditions, and in 1883 a bill for the government of white lead works recognized the principle of special regulations for particular trades, a principle extended by the Act of 1891, so that such rules can be drawn up by the Factory Inspectorate for any industry certified as dangerous by the Secretary of State. A similar development has taken place in Germany, where factories must receive authorization dependent on compliance with elaborate rules as to general ventilation, removal of dust and fumes, temperature, lighting, proper rooms for meals, lavatories and cloak rooms, water-supply, protection from accidents, and exclusion of women and children from dangerous and exhausting processes. The special trades for which regulations have been drawn up in England and Germany are shown in the appended table, taken from Oliver.

Industries for which Special Rules have been Enacted.

ENGLAND.

1. Bichromate works
2. Bottling of aerated water
3. Brass and alloy mixing and casting
4. Bricks, glazing of, by lead
5. Chemical works
6. Earthenware and china
7. Enameling of iron plates
8. Electric accumulator works
9. Explosive works in which dinitrobenzole is used
10. Flax spinning and weaving
11. Lead (red and orange) works
12. Lead (white) works
13. Lead (yellow) works
14. Lead smelting works
15. Lead, yellow chromate of
16. Lucifer match factories
17. Paint and color works, and extraction of arsenic
18. Skins and hides, sorting
19. Tinning and enameling of metal ware
20. Tinning and enameling of iron hollow ware
21. Transfers (lithographic) for decoration of china, etc.
22. Vulcanizing of india rubber
23. Wool sorting
24. Wool combing

GERMANY.

1. Basic slag works
2. Bichromate works
3. Brick works
4. Brushmaking works and horsehair spinning
5. Cigar factories
6. Chicory works
7. Electric accumulator works
8. Glassworks
9. Hackling and preparing rooms in textile factories
10. Lead, color and acetate of lead works
11. Letterpress printing works
12. Lucifer match works
13. Sugar refineries
14. Vulcanizing of india rubber
15. Wire-drawing mills

Less elaborate systems of factory legislation are in force in France, Austria, Belgium, Holland, Sweden, Switzerland and other European countries. It is, however, significant to note that the two nations which have advanced farthest along this path are the two leading commercial powers of the Old World, and that one of them at least owes its ever increasing pre-eminence to the general application of the broad scientific principles of economy of force upon which such legislation is founded.

Turning to the United States we find the regulation of dangerous trades in a primitive and undeveloped state. We lack even statistical information as to the extent of occupation diseases; we wholly lack scientific study of existing factory conditions. In our own State of Massachusetts there is indeed a Department of Inspection of Factories and Public Buildings under the Chief of the District Police, but the officials of this department, however able and efficient, cannot properly solve such complex problems as those of factory sanitation without special expert assistance. Chapters 104 and 106 of the Revised Laws, under which for the most part they work, contain several admirable general principles. It is provided, for example, in Section 51, Chapter 106, that "a factory in which five or more persons are employed shall, while work is carried on, be so ventilated that the air shall not become so impure as to be injurious to the health of the persons employed therein, and so that all gases, vapors, dust or other impurities injurious to health, which are generated in the course of the manufacturing process or handicraft carried on therein shall, so far as practicable, be rendered harmless." This is good so far as it goes. It does not apply, however, to small factories or to workshops where men only are employed. It gives no power to deal with such special evils as lead or arsenic poisoning. Even with respect to ventilation, general provisions are useless unless applied in the form of such detailed and specific regulations as can be drawn up only by expert sanitary authorities.

The backwardness of factory legislation in this country is no doubt in part due to the fact that we have never had the gross

evils which elsewhere become so patent as to demand drastic measures for their redress. Evils exist, however, and though less obvious than those which caused Sir John Simon to speak of "the canker of industrial disease" gnawing at the root of England's national strength, it is high time that we gave them some attention. From the figures in the Census of 1900 I find that there were 127,000 persons in Massachusetts engaged in trades shown by investigation in other countries to be more or less prejudicial to health, including 38,642 foundry and machine shop workers, 26,211 house and sign painters, 17,696 brick and stone masons, and 8112 plumbers and gas and steam fitters. In the more intensely dangerous trades we find 2395 cutlers, 289 emery wheel workers, 89 file makers, 264 grinders of kaolin and other earths, 270 operatives in needle and pin factories, 758 persons engaged in the making of pottery, terra cotta and fire-clay products, and 449 workers in shoddy mills. Judging from analogy it seems probable that the unregulated conduct of these industries and certain others is causing a constant drain upon the health of the community; and in spite of the absence of good vital statistics or scientific factory inspection specific instances every now and then attract our notice. The spread of the disease, Anthrax, in Lynn from a morocco worker who had handled infected hides, was noted in the newspapers only a few weeks ago. The death rate from consumption in Massachusetts according to the United States Census of 1900 was 2.5 among all males, 3.7 among marble and stone cutters and 4.1 among masons; and Dr. T. J. Dion of the Quincy Board of Health writes me that the excessive prevalence of tuberculosis among the stone cutters in that city is a well known fact. In Chester is a factory of which Dr. C. J. Shepardson, a leading local physician, says, "We have a mill in town where quartz or silex is reduced to sandpaper, etc., which has been responsible for a great many deaths. Not much work is done there, however, and I think the force of employees is kept so low that the law as it now exists is not applicable to the place."

At East Douglas is an axe factory, in relation to which Dr.

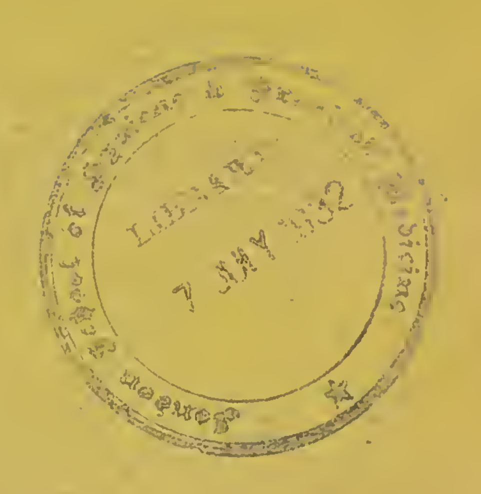
Titus P. Holbrook allows me to quote the following statement: "I have been in practice in East Douglas since 1863 with the exception of some thirteen years following 1872. I have seen quite a number of cases of so-called grinders' consumption. I have examined one case post mortem. I found the smaller bronchial tubes thoroughly filled with the grindstone grit; the lung in the lower part looked like and felt like the liver after cooking. The symptoms are excessive dyspnœa on slight exertion, dry cough and great prostration. The grinders are from the Polanders and Finns for the past dozen years. The disease takes hold of them more frequently, and is more rapidly fatal than among the grinders of former years and of other nationalities. When I came here 40 years ago I found the victims among the Yankees who had ground some 20 years before. Those would grind 18 or 20 years before having to give up work. The French Canadians were then grinding. They could work 12 to 16 years. They became frightened off, and the Swedes took up the work. They would get the disease in 8 or 10 years. Now the Finns and Polanders are at it, and they last only 3 to 5 years, and the disease is more common among them."

It is not surprising to find on an examination of Massachusetts Registration Reports that while the death rate from consumption for the period 1881-99 was 2.5 for the whole State, it was 3.4 for the town of Douglas.

Nearer home I visited within a month a twine mill not five miles from where we are gathered at this moment. I wish I could take you through that factory and show you the dry spinning room with its clear normal air, the carding room filled with clouds of fine choking dust and the wet spinning room with the hot damp deadly atmosphere of a tropical forest. In the first department you would see average healthy factory workers alert and cheerful; in the last two, the women and children, some of them palpably under age, with dull eyes and feverish cheeks, stand or sit listlessly by their machines, stolidly going through the mechanical routine which brings them daily nearer to the inevitable end. The factory inspector had made his visit a few

days before mine; but being neither a medical man familiar with the symptoms of tuberculosis, nor a sanitary engineer, versed in the laws of ventilation, he found no fault except to suggest that the few insufficient ventilating fans which had been installed should be put in operation. When I went through the factory some of them were running and some were not; and as the superintendent told me of the admirable quality of twine he was turning out I could not but feel that the cost as paid in human lives was far too high.

These are isolated cases only. Granted. Yet I believe that in the discussion this afternoon the members of this Association may add many more from their own experience. We have already enough in my judgment to warrant us at least in looking further. We need exact knowledge of conditions here in Massachusetts. We want the State census of 1905 so planned as to furnish statistics of occupation mortality which shall be full and accurate. We want the Legislature to appropriate money for a special investigation of the risks and dangers of factory life by the State Board of Health, which, having solved the fundamental problems of water supply and sewage disposal, should be our pioneer in these new fields. With the facts once in hand, the members of this Association will not be slow to apply the needful remedies. It is the pride of sanitary science that it is founded on the unchanging rock of Nature's laws. Yet we study the world as it is only to make it better; and I believe that the informing motive of our profession, whether we are conscious of it or not, is a deep-rooted enthusiasm for the progress of that humanity which in such diverse individuals is so mysteriously one. These twin impulses, the love of truth and the love of man, are together irresistible; both should impel us to remove the cruel conditions which make it necessary for even one individual to barter the health of tomorrow for the livelihood of today.



THE FAILURE OF EXISTING LEGISLATIVE MACHINERY TO CONTROL INDUSTRIAL ACCIDENTS AND DISEASE

and

TRADE UNION DEMANDS FOR SAFEGUARDING THE HEALTH OF WORKERS

Statement of the Executive Committee
Workers' Health Bureau of America

to the

FIRST NATIONAL LABOR HEALTH CONFERENCE

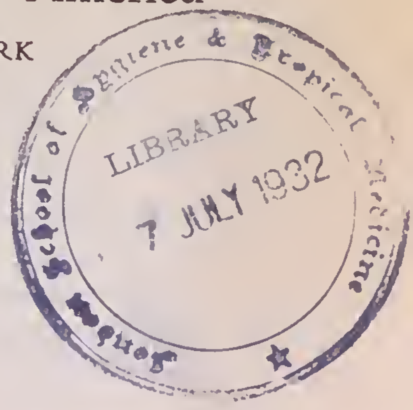
Cleveland, Ohio, June 18-19, 1927

under the auspices of the

Workers' Health Bureau of America

799 BROADWAY, NEW YORK





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The failure of our National Government to act in the present flood situation and the excuse given that there is no department of the Government authorized to act in such an emergency, forcefully brings to our attention the fact that existing Government institutions are inadequate to protect health and life. 114 people have already been killed by this disaster and 568,000 made temporarily homeless. Seven States are affected. And all that could be done was to appeal to private charity, which has raised approximately $16,000,000 for relief.

Yet the spectacle of 35,000 workers killed each year in industry, with a total of 2,500,000 injured, is much more appalling.

The United States Government spends about $16,000,000 annually on Public Health—½ of 1 per cent of our annual budget. This amount is divided among some forty Bureaus or other administrative units. None of these Bureaus has power to do more than make investigations and issue recommendations and reports.

The Bureaus dealing directly with Industrial Health are the Public Health Service, the Bureau of Labor Statistics, the Bureau of Mines, the Women's Bureau, and the Children's Bureau, and less directly, the Bureau of Chemistry and the Bureau of Vital Statistics. These Bureaus are under the jurisdiction of four separate departments: Labor, Commerce, Agriculture, and the Treasury. Added to the ineffectiveness of recommendations which cannot be enforced are duplication of activities and confusion.

The Bureau of Labor Statistics, the first of these departments to come into existence, was created 43 years ago, in 1884, "charged with the duty of acquiring and diffusing among the people of the United States useful information on subjects connected with labor; its relation to capital, the hours of labor, the earnings of laboring men and women, and the means of promoting their material, social, intellectual and moral prosperity!"

It is significant that the Bureau of Labor Statistics, charged with promoting the "social and material prosperity of laboring men and women," should have left the Bureau of Standards, created seventeen years afterward, the formulation of health and safety codes for the protection of workers . . . and even more significant that the Bureau of Standards, instead of taking the responsibility for the immediate preparation and publication of these codes presents its suggestions to a voluntary organization, the Engineering Standards Committee, which is a federation of Employers' Organizations, Engineering Societies, Insurance Companies and Government officials. Each organization, composing this federation, chooses representatives on its various committees. Labor has no direct representation in the organization. The United States Department of Labor chose the President of the American Federation of Labor as one of their representatives on the Safety Codes Committee.

The American Engineering Standards Committee came into existence in 1918 and is financed by private contributions, which now amount to about $60,000 a year. To date, the Committee has completed ten Industrial Codes for the protection of workers, covering Lighting, Mechanical Power Transmission, Abrasive Wheels, Protection for the Heads and Eyes of Workers, Protection for Power, Foot and Hand Presses, and special Codes for Foundries, Laundries, Woodworking Plants, Paper and Pulp Mills, and Logging and Saw Mills.

The Monthly Labor Review of October, 1926, reports that only three States have adopted or have laws in conformity with these National Safety Codes . . . twelve more have "most, part, or laws substantially the same as the codes," while the remaining thirty-three have no such regulations. Georgia and Virginia state that their "laws do not permit adoption of safety codes," while Idaho is content with "asking industries to adopt."

A more comprehensive survey of the activities of the States in this direction was made by Dr. Emory R. Hayhurst, of the Department of Industrial Hygiene of the State of Ohio, in 1925. A letter was sent to every State and territory asking what was being done to protect workers against industrial poisons, to control dust, provide ventilation, proper lighting and other health safeguards. No replies were received from eight States. Seven more gave such incomplete or indefinite replies that "it is safe to infer," says Dr. Hayhurst, "that workers receive a minimum of protection." This is the case for 31 States, or two-thirds of the country. "Of the remaining seventeen States, with few exceptions, 'seats for females' (who are not allowed to use them while at work) and similar limited features constituted most of the

so-called industrial hygiene." In all but half a dozen States, practically all provisions for industrial hygiene are seriously inadequate.

"Enforcement," continues Dr. Hayhurst, "is almost a dead letter in many of the States, principally because of a shortage of personnel or lack of understanding of the subject. With the exception of a handful of States, this personnel is employed chiefly upon safety work, is quite unqualified to take on industrial inspection, admits it and prefers to side-step it."

The Workers' Health Bureau, which extended Dr. Hayhurst's investigation to Building Trades and Mines, confirms his conclusion regarding the inadequacy of State protection. Only seven States have adequate safety codes for buildings under construction, twenty-seven States have no regulations whatever, and the remaining fourteen have a number of inadequate provisions. In regard to building construction it has been the practice to side-step State regulations in favor of letting each city provide its own protection, inspection, and enforcement. To the chaos of forty-eight different State regulations, we have every city making separate provisions for building trades workers. The alarming increase in building trades accidents is the direct result of this confusion and neglect.

The situation in the mining States is equally serious . . . only four States compel rock-dusting, only two define permissible explosives, only one specifies what shall constitute "permissible timber" and so on for the entire twenty-three States.

In this connection it should be pointed out that the Bureau of Mines may "conduct inquiries and scientific investigations concerning mining . . . with a view to improving health conditions and increasing safety" . . . but has no authority to enforce its recommendations, except on 'leased mines," which are government owned.

Whether the Bureau of Mines continues to operate as a separate department or whether it becomes part of a centralized national health department, its present technical machinery for investigation should be strengthened and its present limited powers enlarged. It must be given Congressional authority to enforce its recommendations for the Health and Safety of Miners.

The same lack of authority to enforce recommendations holds good for the Children's Bureau. Here, however, we have a Constitutional Amendment, giving Congress the power to "limit, regulate, and prohibit the labor of persons under eighteen years of age," Until the Federal Child Labor Amendment is ratified by the States, (and so far, only five of the required 32 States have ratified) we have no

national law, regulating the age at which children may go to work, or protecting them from working with poisons, explosives, or dangerous machinery. The situation State by State reflects the same lack of uniformity as we have shown for other standards. Children of 14 may go to work in 41 States. In only two has the lower limit been fixed at 16. Georgia calls for work "from sunrise to sunset," 24 States allow children to work a 7-day week.

Our Women's Bureau, which came into existence during the war "to develop the industries of the country . . . using women's services most effectively for war production . . . while at the same time preventing their employment under injurious conditions," also stands without authority to enforce its recommendations. As a result, four States in no way regulate the hours which women may work . . . twenty States allow a ten-hour day and four more from ten to twelve hours daily. *Illinois, South Dakota, Oregon and Virginia allow a 70-hour week.* Only five States prohibit the employment of pregnant women for periods ranging from two weeks before to four weeks after childbirth. No provisions are made for the payment of wages during this period.

Will the Trade Union movement continue to tolerate this situation? Are we satisfied with the fact that in the year 1927, we still have no State where the 8-hour day is legally in operation, that only three States provide one day rest in seven, that after fifteen years of agitation, five States and the District of Columbia still have no Workmen's Compensation laws, that 29 States provide no compensation for occupational diseases, and that in no State does an injured worker receive compensation even approximating his weekly wages?

Are we content to go to legislature after legislature, in 48 States year after year, asking for piecemeal legislation, and meeting ever increasing opposition and defeat as the employers strengthen their own political machinery for keeping all new labor legislation off the statute books and plan to undermine and repeal such limited protection as organized labor has already won?

Shall the United States stand as the only country with no National Laws for the protection of Labor, with such countries as France, Germany, Chile, Great Britain, Hungary, China, Japan, and Russia adopting National Legislation regulating hours of labor, night work for women, one day rest in seven, regulation of the use of lead and other harmful materials?

For several years prior to 1912 there had been a definite movement throughout the country for the establishment of a national bureau

of health. Bills to this end were introduced in Congress as far back as 1910, but failed to pass. Instead the name of the Public Health and Marine Hospital Service was changed to the United States Public Health Service and its activities and appropriations were somewhat extended. The United States Public Health Service is empowered to prevent the interstate spread of disease. It has authority to invoke Federal powers when local regulations are inadequate. The study of occupational diseases and industrial hygiene was made one of the functions of the Service in 1914. It was the United States Public Health Service which made the public investigation of Tetra Ethyl Lead in 1925-26, but admitted that it had no authority to prohibit the manufacture of this material, nor require States or Companies to carry out protective regulations, except by special act of Congress.

We believe that it is the responsibility of this first National Labor Health Conference to critically survey the field, examine our government machinery and recommend a national program which will bring to the 40,000,000 workers of this country safety on the job, nationally as well as State by State.

The Workers' Health Bureau therefore recommends the following national trade union program of health and safety to control accidents and occupational diseases in the United States of America:

Congressional Action for:

The Mining Industry

To empower a Department of the Federal Government to adopt and enforce adequate national health and safety regulations for the Prevention of Accidents and Deaths in the Mines.

The Control of Industrial Poisons

Empowering a Department of the Federal Government:

To investigate the hazards of all new industrial poisons before their manufacture and sale.

To prohibit the introduction and use of such industrial poisons, the hazards of which cannot be controlled.

To require the necessary safeguards for all other industrial poisons.

To prohibit interstate shipment of all poisons unless properly labeled to show all ingredients and percentages thereof.

As an immediate step we recommend the prohibition of benzol, wood alcohol, and for the painting industry the prohibition of lead.

The Control of Dangerous and Unguarded Machinery

Standard national requirements for safe, properly guarded machinery.

The provision of an official label for safe and properly guarded machinery.

The prohibition of interstate shipment of machinery unless labeled as safe.

Compensation for Railway Workers: To be based on the Federal Compensation Act for Government Employees.

Trade Union Action

The immediate preparation of National Health and Safety Standards for the Protection of Workers in all Organized Trades.

The appointment of Standing Committees from the respective trades to co-operate with the Workers' Health Bureau in the drafting of such standards.

The inclusion of Health and Safety Clauses based on National Standards in Trade Union agreements.

The inclusion of the 40-Hour Week with further reduction of hours in extra hazardous trades and Compensation Insurance for Accidents and Occupational Diseases in Trade Union agreements to supplement existing State laws.

Appointment by the union of Inspection Committees on every job to secure rigid enforcement of Health and Safety Agreements.

Organized Labor to demand equal representation in all Labor Departments and on all Government Committees relating to the Safety, Health, and Welfare of Workers

State Action

The adoption of Uniform and Adequate Safety and Sanitary Codes based on National Trade Union Standards to be drafted in every State.

Labor Commissioners or Industrial Commissions to be empowered to improve codes by adding regulations whenever necessary without legislative mandate.

State Departments of Labor to be responsible for enforcement by the provision of adequate and properly trained inspectorial

staffs and co-operative arrangements with cities for the use of their inspectorial staffs.

Adequate and uniform Workmen's Compensation Laws for accidents and occupational diseases.

Triple compensation benefits to be provided for children under 18 years of age, injured in industry.

Child Labor

Prompt ratification of the Federal Child Labor Amendment giving Congress the power to limit, regulate, and prohibit the labor of persons under 18 years of age.

Simultaneous action in all States to gain legislation for the prohibition of the labor of children under 16 years of age and the prohibition of the labor of children between the ages of 16 and 18 in all dangerous and unhealthful employments. Hours of employment shall be limited to five per day, five days per week.

Employment of Women

Prohibition of the labor of women in all dangerous and unhealthful occupations.

The prohibition of their employment six weeks before and six weeks after childbirth with State maternity insurance, providing payment of full wages during this period.

Night Work

The prohibition of night work between the hours of 6 p. m. and 8 a. m. for:

All young workers under 21.

All women.

The prohibition of night work in bakeries.

One Day's Rest in Seven

The assurance of a minimum of one day's rest in each seven for all workers.

The District of Columbia

Congressional action to provide the above recommendations outlined for States for all workers in the District of Columbia, since the District of Columbia must rely on Congress for its legislation.

